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CONSERVATION EDUCATION

BULLETIN 214

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COMMONWEALTH OF PENNSYLVANIA

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LESTER K. ADE - - *Superintendent*

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FOREWORD

FOR MANY years the problem of conserving the material resources of the Commonwealth has been a major consideration of public-minded citizens and their representatives. Through the medium of this bulletin the Department of Public Instruction attempts to carry on the work of preserving the soil, water, forests minerals, health, wild life, and scenic and historic wealth of Pennsylvania by relating what has been done and stressing what more must be effected.

LESTER K. ADE
Superintendent of Public Instruction

May, 1939

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NOTE

CONSERVATION Education is the eleventh in a series of books and pamphlets published by the Federal Writers' Project in Pennsylvania and the first of a group of bulletins written by the staff for the Department of Public Instruction of the Commonwealth of Pennsylvania.

The bulletin was prepared by Ethel G. Eisenberger, Jackson C. Trueitt and Jacob Silverstein of the Dauphin County Unit. The cover was designed by Ot Schmidt.

PAUL COMLY FRENCH
State Director

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Courtesy of U. S. Soil Conservation Service, Department of Agriculture.

Earth and Sky.

I

SOIL CONSERVATION

Life Depends on Soil

SOIL is our most fundamental natural resource because all of the higher forms of plant and animal life depend on it. Every human being is directly or indirectly dependent upon the products of the soil. Its conservation is paramount, particularly when we realize that it takes nature from 5,000 to 10,000 years to create a foot of topsoil from inert, earthy materials and the remains of plant and animal life.

Plant life would be impossible without soil. Some plants pass their life in the oceans, ponds, or streams, but even there they receive their food from soil material in solution. The root systems of plants, with the many fine root hairs twining about soil particles, anchor the plants and, in turn, prevent the soil from being washed or blown away.[1]

Soil is a composition of rock particles, air, water, and organic matter called humus. Numerous organisms, including earth worms, nematodes, protozoa, rodents, insects, bacteria, yeasts, and molds, live in the soil and play a part in its development. They work on the organic matter in the soil preparing it for use by the higher plant forms. The worms and rodents promote the circulation of air and water by constantly mixing the soil.[2]

Water supplied through the soil is essential to the life processes of a plant, the water-holding capacity of a particular soil being determined by the character of that soil. "The fundamental life material, protoplasm, is largely water, hence large quantities must be absorbed by the plant."[3]

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[1] *Science Guide for Elementary Schools.* Vol. IV. p. 9.
[2] *Ibid.* p. 1.
[3] *Ibid.* p. 9.

The upper few inches of soil are those most useful for plant growth. They have the necessary combination of earthy materials, humus, plants, and animals. From this more fertile surface layer, often not more than six inches deep, the soil shades into the far less fertile subsoil, which can only be transformed into productive soil with great effort and expense. The subsoil is usually raw and barren.

EXTENT OF GOOD SOIL

The Natural Resources Board of the United States says that even this rich country does not have vast areas of the best soil. It lists five classes, calling the best land "Grade 1" and the poorest, not really fit for farming, "Grade 5."

Only five and three-tenths per cent of the United States consists of Grade 1 land; forty-six per cent consists of Grade 5. In Pennsylvania, a mountainous and hilly State, the level and gently rolling southeastern part has the greatest proportion of rich and fertile soil. The extreme northwest, along Lake Erie, also has productive soils lying on relatively gentle slopes. In most other sections of the State the hills are more pronounced and are generally more subject to loss of topsoil by washing. A considerable part of the central section consists of forested mountain ridges little used for agricultural purposes. Since there is relatively little good land, the importance of saving what we have is obvious.

One-twelfth of Pennsylvania's people live on farms, which cover more than half of the land in the State. There were more than 191,000 farms in Pennsylvania at the time of the last census in 1935. This was far below the total of 224,248 in 1900, but it was an increase of 20,000 over the 1930 aggregate, indicating, probably, that unemployment has caused the return of many people to the farm [4]

SOIL EROSION AND CAUSES

Economic waste results from the removal of the rich topsoil by man-made erosion. Geologic erosion has always existed, of course, and always will exist. It consists of the gradual movement of soil over long periods of time. The farmer is not interested directly in this phenomenon of nature. He is vitally concerned with the acceler-

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[4] *Pennsylvania, an Inventory.* p. 48.

Courtesy of U. S. Soil Conservation Service, Department of Agriculture.

Plowing a terrace in Lancaster County.

ated soil erosion which follows the use of certain farming practices and other activities of man.

"Thousands of acres of formerly profitable Pennsylvania farm land are no longer fit for growing crops. Successive decades of plowing, cultivation, and rain washing has resulted in the rich surface soil being washed away, little by little. When rain water moves soil downhill, it washes it bodily from farm lands, in addition to leaching the important elements from the topsoil layer. At the present time more than half of the land surface of Pennsylvania suffers from erosion in some degree—from twenty-five per cent to more than seventy-five per cent being washed away. Unless care is taken, and improved farming methods are practiced, there will be a continuing loss of soil at a greater rate."[5]

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[5] *Ibid.* p. 48.

In the past our agricultural resources have been generally assumed to be boundless and inexhaustible. Today, with such phrases as "dust bowl" becoming common, the relationship of soil erosion to our state and national conservation policy is becoming apparent. The social implications of eroded, abandoned farms, and dust storms are clear, since continued and increasing erosion threatens our basic food supplies and our economic security. Some agriculturalists have long been familiar with the effects of accelerated erosion, but public attention was not focused upon it until the dust storms of 1934 and 1935 came as a dramatic warning.[6]

"Water and wind are the two most important causes of erosion. Water causes sheet erosion and gullying. Sheet erosion takes the form of the gradual, even almost imperceptible removal of soil from a sloping field, usually preceding gullying. When gullies appear, it is a sure sign that sheet erosion has been quietly at work for some time.

"Interrelated factors affecting the rate of erosion are the types of soil; its structure and its degree of permeability by water; steepness and length of slope; the speed with which the snow melts; the amount of rain and the intensity with which it falls; kinds of crops raised; farming practices followed; clearing and cutting practices used in woodlands; and the after effects of brush, grass and forest fires which denude the land of its cover.

WATER EROSION

"Sheet erosion occurs when run-off water rushes across sloping fields that are not protected by trees, grass, or artificial means. Its effect can sometimes be noted by the appearance of light-colored patches of subsoil on exposed portions of the field. Most people are familiar with the clear, sparkling streams of our forests and parks and the silt-laden streams in cultivated areas. Forest streams carry little silt because of the abundance of trees. The silt in the other streams was once the top layer of soil, and its continuous planing-down year after year will remove the economic base of the farm, to be deposited in a useless form downstream. When upland topsoil is all removed, stone and gravel are carried by the water to the valley below.

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[6] *Science Guide for Elementary Schools.* Vol. IV, p. 15.

"Gully erosion may start from small rills formed when the rain rushes along a channel formed by cultivating tools. Once a definite channel is established, the eroding power of the water grows. Small gullies spread and cut back at the head and side. Not only is the eroded field injured or destroyed, but the debris carried by the water is deposited on fields farther down the slope so that their usefulness for agricultural purposes is seriously impaired."[7]

WIND EROSION

In general, wind erosion is unimportant in the humid region, this being particularly true in Pennsylvania and the rest of the northeastern states. However, the wind does cause damage to soils locally by blowing sand over valuable areas, and by drying and reducing exposed humus.

Areas of loose or wind-formed soils are the result of wind action in times long past. These soils have been stabilized, however, by their grass and tree cover. It was the destruction of the grass cover by plowing and overgrazing that helped cause the great dust storms in the Prairie States following the drought of 1933-1934. The drought and changes in the physical condition of the soil did the rest.

EROSION CONTROL MEASURES

Wise farmers try to put each piece of land to the use for which it is best fitted; however, the practical necessity of earning a living forces thousands of farmers to ignore the rules of good land use. Trees, grass, and inexpensive mechanical structures are the elements from which an erosion control program for a farm is fashioned. Sometimes one measure of control is sufficient to protect a field, and sometimes full protection requires that several measures shall be combined.

Trees and Grass

On steep slopes, subject to severe erosion, trees are about the only crop that can be grown profitably over a period of time. Properly managed and protected from fire and grazing, a woodland fully protects the soil from washing onto fields below and also yields an

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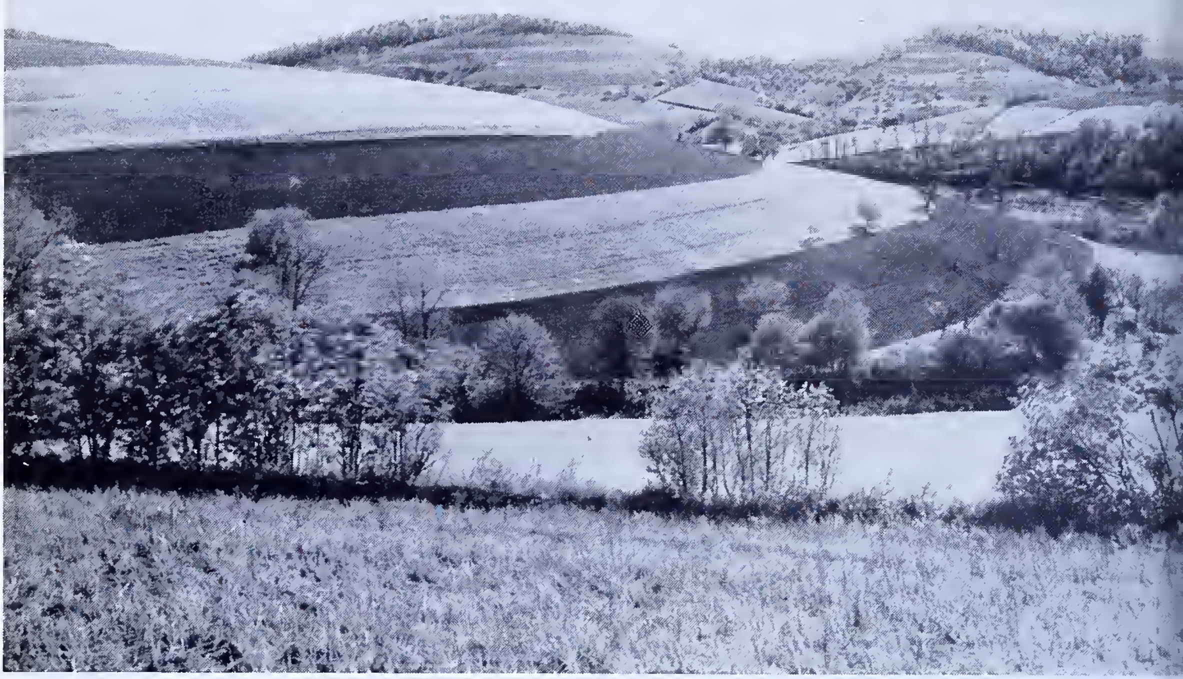
[7] *Science Guide for Elementary Schools.* Vol. IV, pp. 16-20.



Courtesy of U. S. Soil Conservation Service, Department of Agricultur

Contour plowing for soil conservation.

annual income to the farmer. Quite often, trees are the only crop that will grow on steep eroded slopes.

Next to trees, a thick grass cover is the best anchor for the soil. Pastures or hay fields reduce the force of the water on steep slopes and give it a chance to sink into the ground. So effectively does grass counteract the erosive action of run-off rain, that experiment station records show soil is built faster than rain can wash it away under a heavy turf. Thin, weedy pasture is a poor protection against erosion. Pastures need lime, fertilizer and proper management, in order to create a dense protective sod.

Croplands

Usually the most severe erosion occurs on cropped fields because the soil is most exposed there. The methods of control used are vegetative and mechanical. Vegetative measures involve the use of grass and intertilled crops. So-called mechanical methods involve simple construction work which can generally be accomplished by using materials and equipment available on the farm.

Vegetative controls include such practices as crop rotation, contour plowing, contour strip cropping, the use of cover crops, and sodded water-drainage ways. Crop rotation makes use of a succession of crops in such order that the same field is not occupied for two consecutive years by an intertilled crop. Usually a rowed crop is followed by a small grain crop, and then by one or more years of hay. Contour plowing is plowing around the level of the hill, instead of up and down; each plow furrow is a tiny dam that slows the water. Strip cropping means that the crops are arranged around the slope in narrow, ribbon-like fields with grass strips alternating with crop strips of equal width, the grass strips catching the water from the cultivated strips above. When the farmer uses cover crops, he puts a blanket of vegetation on land that would otherwise be bare and exposed to the rains. Sodded waterways are safety valves for drainage; some water always has to flow off a field and, if the natural drainage depressions are kept in sod, the danger of gullying is minimized.

Structures

Mechanical methods of control used in Pennsylvania can be divided into measures of prevention and of cure. The various types of terrace structures prevent soil washing and gullying. Gully control structures cure or stabilize sore spots and minimize further damage.

Terraces used by American farmers bear little resemblance to the Asiatic and European structures built at tremendous expense in human labor. Terraces are gentle ridges that run around the hill on a slight grade and carry water slowly to a safe outlet. A tractor and a terracer, which looks like the ordinary township road grader, erect them quickly at little expense. On some soils and slopes the terraces can be cultivated like the rest of the field; on steeper slopes they can be planted in hay. Terraces are also used in orchards to save soil and moisture.

Gully control calls for trees, grass, logs, stones or any similar material the farmer may have available. Simple log or stone dams slow up the turbulent rush of water down a gully. In this way its cutting power is reduced and part of the silt it carries is deposited behind each dam. Young trees and grass can then be planted, to effect a permanent cure. However, it should not be forgotten that the best way to handle a gully is to prevent it from forming; diversion ditches, terraces, strip cropping and other controls afford such prevention.

CHANGES IN LAND USE

Sometimes, the application of erosion control measures to a farm does not solve all of the problems that nature has created. A terrace cannot bring back soil and fertilizer that has been washed away. Farms, already bankrupted of their topsoil, are in no condition to provide a living, no matter what kind of farming practices are followed. Economic necessities many times conflict with the physical demands of the land. The job of erosion control is to conserve the land as it exists, and gradually return it to a more productive condition.

Good land use, in its broader sense, requires the combined efforts of farmers and of State, Federal and private agencies interested in assisting agriculture.[8]

Erosion Control Agencies

Federal action to control erosion was inaugurated in 1929, when an appropriation was made to conduct experiments into the causes and cures of soil erosion. "In 1933, the Soil Erosion Service was established in the United States Department of the Interior, and erosion control demonstrations were started in problem areas throughout the country. The Soil Erosion Service was transferred in 1935 to the Department of Agriculture as the Soil Conservation Service, and the scope of the work enlarged."[9] At the present time the Soil Conservation Service conducts research work in soil conservation in cooperation with the various Colleges of Agriculture; it carries these results to farmers through demonstration areas; and it renders technical assistance to soil conservation districts formed by farmers under State laws. There are demonstration areas in twelve Pennsylvania counties, ranging from 25,000 to 120,000 acres in size. County agricultural agents are in a position to supply information to farmers about the best methods of controlling erosion and maintaining fertility. Nearly all counties in Pennsylvania have vocational

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[8] *Science Guide for Elementary Schools.* Vol. IV, p. 27.
[9] *Ibid.* p. 30.

Courtesy of U. S. Soil Conservation Service, Department of Agriculture.

Scientific plowing prevents gullying.

and agricultural supervisors who work under the Department of Public Instruction.

PENNSYLVANIA'S CONTROL SYSTEM

Pennsylvania's erosion control program attacks this great economic problem from several directions. The State Department of Agriculture, through the Soil Conservation Districts Act passed by the 1937 legislature, is encouraging land occupiers having common erosion problems and hazards to organize districts for community or cooperative action. The Pennsylvania State Soil Conservation Board is administering this act and has approved the organization of districts in several watersheds.

Another phase of the problem is the reforestation and flood control work of the Department of Forests and Waters. A system of dams is proposed to aid the new forests in retarding the flow of water from the upper reaches of the several river systems of the State.

The part assigned to the State Department of Highways in the campaign to conserve Pennsylvania's rich topsoil, consists of roadside planting and scientific drainage methods on highway right-of-ways.

SOIL CONSERVATION GUIDE FOR USE AMONG TEACHERS

1. Erosion can be studied in the school yard after any heavy rain. Are puddles muddy? Is there a new deposit of fine soil in low places when water dries? Have other things been moved by water?
2. The interest of the pupils also may be enlisted by visiting the banks of any small stream to see stream bank-cutting and silt deposits resulting from erosion.
3. An invitation can be extended to a State official or county farm agent to explain to the class State and national plans for soil conservation.
4. Why do we have the Dust Bowl? The teacher might read an article from a magazine to the class. A bibliography of printed soil conservation material is appended. The children could outline the material which should be included in a study of soil conservation.
5. Pupils can turn to farm papers, daily newspapers, current magazines, and government bulletins for more information. Pictures from magazines and commercial bulletins can be collected and pasted in a scrap book.
6. Sketches can be made of trees, terraces, and dams, or cartoons can be drawn depicting the effects of erosion on farm land.
7. General excursions can be made under the guidance of the classroom teacher and principal, a conservationist, the Farm Agent, or others concerned with conservation problems. Technicians at soil conservation demonstration area offices or county agents will be glad to help to arrange tours.

8. "A demonstration can be arranged to show how water washes away soil with no turf upon it, and how little washing occurs when water is poured on turf-covered soil."[10]
9. Conduct a free discussion period after each lecture on soil conservation. Committees can be organized among the pupils for study of each phase of the problem. The class can keep a list of the new words learned from studying the conservation of soil.
10. The subject may be incorporated into the science, social studies, or visual education program of a school located in an area where serious soil erosion is an immediate problem.
11. "In the elementary school, soils can best be studied by direct observation in the field and the performance of few simple experiments or demonstrations in the classroom."[11]
12. Moving pictures, film strips, and other visual aids are available from the U. S. Department of Agriculture. A list of such aids is appended.

Bibliography Available to the Classroom

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[10] *Ibid.* p. 41.
[11] *Ibid.* p. 48.

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Strip Cropping for Soil Conservation. Soil Conservation Service. U. S. Department of Agriculture Farmers' Bulletin 1776. 37 pp. June, 1937.

Terracing for Soil and Water Conservation. Soil Conservation Service. U. S. Department of Agriculture Farmers' Bulletin 1789. 60 pp. April, 1938. (Supersedes Farmers' Bulletin 1669 entitled "Farm Terracing.")

What Is Soil Erosion? Soil Conservation Service. U. S. Department of Agriculture Miscellaneous Publication 286. 84 pp. February, 1938. Fifteen cents per copy from Superintendent of Documents, U. S. Government Printing Office.

Film Strips and Motion Pictures

(Available from the U. S. Department of Agriculture,
Washington, D. C.)

Soil Erosion, a National Menace	96 frames
Gully Control and Terracing Experiments	47 frames
Erosion Control in the North Atlantic States	36 frames
Tillage to Control Wind Erosion	48 frames
Contour Furrows	32 frames
Strip Cropping	35 frames
Farming Practices that Conserve Soil and Water	48 frames
Soil Erosion in the United States	48 frames
CCC Fights Erosion	1 reel
Muddy Waters	2 reels
Forest Fires—Or Game?	1 reel
Stop Forest Fires	1 reel
Grass Land	1 reel

II

CONSERVATION OF WATER

Control of Streams

HUMAN, animal, and plant life depend on water. Man is entirely dependent upon nature for his supply, therefore the urgent need for its conservation. In 1905 the State Government took charge of planning the use, conservation, and development of Pennsylvania's water resources for the public welfare.

Water for domestic and commercial use is drawn mostly from large streams to serve areas where population is concentrated. If these streams are likely to flood in wet seasons and become low and sluggish in dry seasons, they are not dependable sources of water. Streams which are not fed by fresh tributaries during dry, hot weather become contaminated, and great expense is incurred in purifying the water. Water heavily treated with chemicals is unpleasant to taste and in many cases not suitable for commercial use. Forest-fed streams are generally clearer, fresher, and more constant in flow than streams in open country.

RAIN REPLENISHES STREAMS

"The streams are replenished by rainfall. The annual average rainfall in Pennsylvania, during the last fifty years, has been forty-two inches. Rain is absorbed by the soil to some extent, serving to replenish underground wells and springs, but about half of it drains into the brooks, creeks, and rivers from which men draw most of their water supply. Pennsylvania's most important river systems are the Delaware, Susquehanna, and the Ohio.[12]

"We suffer from drought, or an inadequate supply of water, in years when much less than the average amount of rain falls. Crops are affected unfavorably, wells and streams dry up, rivers run dangerously low, forests and animals suffer, and people must cut their use far below normal."[13]

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[12] *Pennsylvania, an Inventory.* p. 55.

The store of ground water (the result of rain) cannot be overemphasized. Absorption and infiltration occur during precipitation, the penetration at first being rapid. It becomes more gradual as the soil is sealed and covered with puddles, the pores and earthworm and root perforations being closed by the swelling of the material in the soil. The absorption is also slowed when the water reaches a comparatively impervious layer. If there is a sufficient supply of rain, the water fills the porous masses completely. Here it is held as a reservoir from which it leaks to the surface in springs.

"Pennsylvania, fortunately, does not have serious droughts nearly so often as do the midwestern states. Droughts occur frequently enough, however, to make it necessary to plan to meet them intelligently."[14]

SAFEGUARDING WATER CONSUMERS

We must have pure water for drinking, cooking, bathing, washing, and other purposes. A safe supply of pure water is the first essential in building a new house or planning a new community. Every safeguard must be enlisted to prevent contamination of the supply.

"The water supply is regarded generally in terms of its use by private families in kitchen and bathroom, and for recreation and transportation; however, its industrial and commercial consumption is also vital. Pennsylvania's industries use more water than all her private homes combined. From two to three billion gallons are used every day by coal mines, railroads, industrial plants, and generators of electric power.

"The important concern of the State and local governments is to supply and protect the great quantities of water and to prevent communities and industries from encroaching on each other's water rights."[15]

The Water and Power Resources Board of the Pennsylvania Department of Forests and Waters is charged with keeping a complete inventory of all the water resources of the Commonwealth, and the collection of all pertinent data in that connection. It determines the points at which storage reservoirs may be constructed for flood control, for municipal and domestic supplies, and for hydraulic and hydro-electric power. It makes surveys and investigations; designs and constructs hydraulic works for flood protection; and plans for increasing the dry weather flow of streams, and for the protection of river banks from erosion. It cooperates with municipalities in the establishment of channel lines, defining the width and alignment of streams so as to provide channels of adequate carrying capacity for floods. The board inquires into the safety of dams and maintains gauging stations which forecast freshet and flood conditions.

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[13] *Ibid.* p. 55.
[14] *Ibid.* p. 55.
[15] *Ibid.* p. 56.

PREVENTION OF POLLUTION

"Pure water is the constant interest of the Pennsylvania Department of Health. Water, when polluted by dirt, filth, sewage, or industrial waste, becomes dangerous for drinking and bathing, unless treated. More than four-fifths of the State's inhabitants receive purified water, distributed by 700 water works. Private wells and springs take care of the remaining citizens. These private water supplies, the great majority of which are located in the country, are less safe than the purified public water supplies of the cities, as indicated by the larger percentage of typhoid fever cases in rural Pennsylvania. The department is trying to make private water supplies safer by inspecting wells, and by suggesting ways of safeguarding them."[16]

"Contamination of water supplies caused a steady succession of epidemics in Pennsylvania in the early part of the century, with thousands of deaths from typhoid fever. The disease is now rare because of the efforts of the State Department and local boards of health to improve sanitary conditions. Constant supervision of water supplies and sewage is necessary, however, to keep disease under control."[17]

The State Health Department issues permits to all firms engaged in supplying bottled water to the public. Through its traveling laboratories and the central laboratory, examinations of public and semi-public roadside water supplies are made, and approval notices or warnings posted. In addition, upon request, samples of water are collected, examined, and reported.

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[16] *Ibid.* p. 57, 59.

[17] *Ibid.* p. 57.

The department has district engineers to supervise local conditions. It also licenses and supervises all public swimming pools and controls the sanitation of summer camps. No water company is allowed to sell its product without the department's approval of its supply source and purification methods. Not only must the water supply be purified, but the storage reservoirs must be carefully protected.

SEWAGE KEPT SAFE

"Sewage is water made dirty by human use. Accumulation of this soiled water near dwellings in gutters, privies, and cesspools is a serious menace to health. It is dangerous to allow the soiled water to drain through sewer pipes into a passing stream without first treating it to remove poisonous matter.

"For public health protection, the safe way to dispose of sewage is to drain or pump it from each house and building through underground sewer pipes to a central sewage disposal plant. Here it is carefully treated to destroy impurities and then discharged into a river or creek at a point well below the source of fresh water supply."[18]

The design and operation of all water works and sewage disposal plants is controlled by the Pennsylvania Department of Health. The department also has limited control over industrial pollution of streams in the State, though most of the improvement secured in recent years has resulted from cooperation with the industries.

INSURING A STEADY WATER SUPPLY

The great drought of 1930-31, when cities were required to transport water by trainloads, and farmers were obliged to truck water over long distances demonstrated the necessity of better provision for a steady water supply.

In practically every section of the State the question of stream flow is of major importance. In many sections seasonal droughts cause streams to become low and sluggish or to dry up entirely. The problem of fluctuating flow seems to grow steadily more acute.

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[18] *Ibid.* p. 59.

Maintaining the normal flow of water from water sheds is one of the important objects of forestry and other agencies.

"Pennsylvania uses artificial means such as storage reservoirs to store the flow of her rivers and streams to prevent suffering from water shortage due to the undependability of the average stream. The 900 water storage reservoirs of Pennsylvania multiply many times the value of the rivers and creeks. They have a total capacity of 238 billion gallons. Pymatuning Reservoir in Crawford County with a storage capacity of sixty-four billion gallons is the largest to be built by the Commonwealth thus far.

"A stream which, undammed, could furnish in dry seasons only enough water for a town of 3,200 inhabitants, can be regulated by a storage reservoir so that it will provide a steady supply throughout the year for a city of 100,000 population. Even during extreme drought a community that stores its water in a reservoir usually has enough to fill its needs; whereas, if it depended upon drawing water directly from the stream's daily flow, it would suffer privation.

"Every urban community in former years had its own water works. Today the tendency is for neighboring cities, boroughs, or townships to combine in organizing their water supply, a more efficient and economical method. Under consolidation, the pumping stations and purifications works need not be duplicated, and a single source of supply may be used without danger of one community infringing on another's rights. Such cooperation also makes it possible for districts to look ahead twenty-five or thirty years and make plans for an adequate water supply to meet their future needs."[19]

FLOOD CONTROL

Some of Pennsylvania's streams overflow every few years and cause serious damage to lives and property. The rise usually follows exceptionally heavy rains or sudden thaws. As vegetation, especially forest cover, is removed from slopes, run-off is accelerated. Accumulated run-off helps to cause floods.

Few communities have adopted methods of modern engineering to prevent flood damage. Storage basins can be constructed to

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[19] *Pennsylvania, an Inventory.* p. 56.

Courtesy of Glen Lowry Studio, Stroudsburg,

Johnson's Pond near Gouldsboro, Lackawanna County.

divert and retard abnormally high waters; channels can be deepened and improved, and protective embankments and levees built.

Thoughtful communities remove obstructions that encroach upon the channel. State law makes it illegal for anyone to construct such obstructions without a State permit.

Forests serve as partial insurance against some kinds of flood. The more forest area we conserve in Pennsylvania, the better protection we shall have from floods, as forests help to regulate the flow of streams. When streams are protected by forests for a large part of their course, flood damage is less serious, since tree-shaded soil retains great quantities of moisture.

Flood control is a vital phase of the conservation program in Pennsylvania because floods cause loss not only to homes, livestock, and farm soil, but they also clog stream beds with soil and debris, fill navigable channels and reservoirs, and destroy roads and bridges. The debris and eroded soil are often deposited on valuable farms, roads, streets, and buildings. Stream channels clogged with silt from eroded farms and hillsides cannot carry the amount of water which pours into them.

IRRIGATION

Irrigation is the watering of land by artificial means to enable crops to be grown, or to increase the productivity of the soil. In arid lands like Egypt, or parts of our own western country, the ability to use water in irrigation is necessary to the existence of civilized life. When there is no irrigation, there is desert. Irrigation has its greatest reward in arid lands, but its benefits are not confined to regions of scanty rainfall.

Nor are the benefits of irrigation limited to supplying the moisture needed by crops. There are large areas of land where the chief benefit from irrigation is the control of temperature. Cranberry marshes are flooded to protect them from frosts. In elevated regions, irrigation lessens the danger from summer frosts. The success of this form of irrigation depends on having warm water, which is derived either from springs or the sewage of cities and towns.

Irrigation is a very old process. The earliest Egyptian sculptures show water being raised from the Nile in buckets and poured on the thirsty soil. There are irrigation works in southern India built by the Hindus which antedate the Christian era. In some countries, irrigation has arisen and disappeared with the civilization of which it formed a part, such as the Aztec civilization in the western hemisphere.

PHASES OF IRRIGATION

Irrigation falls into three general phases, irrigation engineering, irrigation practice, and irrigation institutions. The first of these includes the determination of the amount of the water supply and the design and construction of works to render it available. The second includes the methods of preparing land for applying water, the quantity needed by different crops, and the time and manner of its application to secure the best results. The third deals with laws and customs which fix the ownership or control of water supplies and the business and social relations of water users to each other and to the public. Each of the irrigation phases has a vital influence on the value of irrigated land and on the peace and prosperity of the irrigated areas. Since the majority of streams which supply the water for these projects originate in the forest, protection and care of the forests is of primary importance. Large storage basins and dams supply the water for the more extensive projects. Great reservoirs are often located in the mountains at considerable distance from water users, where silt-free water from the forest can be obtained. Many of the smaller irrigated farms are entirely dependent upon the forests for regulated water supply.

WATER POWER

The first water developments made use of paddles or wheels to turn machinery situated near streams. Many early sawmills and gristmills were of this type, but the necessity of locating mills at the water's edge limited their possibilities.

With the development of electric power, energy produced by water could be transmitted many miles from the streams. Although the direct or mechanical power of water is still used to operate machinery, the greatest power plants are those which transform mechanical power to electric energy. Water turns huge dynamos which produce electricity and supply light, heat, and power to cities, homes, and factories.

The distance to which electricity can be transmitted is limited; hence water power plants are located only where their cheapness and dependability surpass those of other power sources. Where water power plants are economically practical, forests are important factors in assuring the necessary water supply. Although in many regions coal can now produce power more cheaply, it must be remembered that coal is a resource that cannot be replenished.

Water Conservation Guides Useful for Classrooms

1. Tell the story of your school and home water supply.
2. Review methods of purifying water supply.
3. Discuss pollution of streams and lakes; its effect on health.
4. Study water as a distributer of soil. Also as a destroyer of soil.

5. Discuss with children where Pennsylvania's rivers rise.
6. How many factories in the district are discarding waste into streams?
7. Study Pennsylvania regulations regarding pollution, obtainable from the State Department of Public Health.
8. Discuss floods and their control.
9. For kindergartens and the early grades, make excursions after a rain to see what has become of the rain water. Study pictures which illustrate the work of rain water.
10. Visit and discuss the neighborhood lakes. Report and account for any changes in water level; any changes in clearness of water; any growth of weeds or water scum; animal life in water or on shores.
11. In the higher elementary grades, take field trips to see the action of water from melting snow, ice and rain; find gullies; learn what kind of soil the water carries off the farms.
12. For the upper grades, discuss Pennsylvania's water storage reservoirs, their capacity. Consider how water power produces electricity.
13. Discuss water in navigation and transportation.

Books Available for the Classroom

The following books can be obtained free of charge from the Pennsylvania State Department of Health:

Model Ordinance Sanitation of Tenement, Lodging and Boarding Houses, Boroughs or Townships of the First Class
Model Nuisance Ordinance
Model Smoke Ordinance
Model Garbage Ordinance
Safe Water Supplies and Waste Disposal for Rural Residents
Septic Tanks
Common Sense Sanitation
Directions for Constructing Cesspools
Laws of Pennsylvania Relating to Public Health
The Vaccination Law
Quarantine Laws
Rules and Regulations of the Department of Health
Milk Law

Rules and Regulations as to Sanitation in Tenement, Lodging and Boarding Houses

Rules and Regulations as to Public Health Nuisances

Rules and Regulations for Control of Sanitation in Camps Used by the Public

Rules and Regulations for Control of Sanitation in the Shellfish Industry

Rules and Regulations for Bathing Places, Swimming Pools and Natatoriums

Rules and Regulations of the Department of Health and Advisory Health Board to Be Observed by Undertakers, Sextons, etc.

State Plumbing Code, Act 44—Approved March 31, 1937

Stream Pollution, Act 394—Approved June 22, 1937

III

CONSERVATION OF FORESTS

Why Forests are Needed

FORESTS are necessary to control erosion, maintain water levels, control floods, and to serve as a home for wild life and wild vegetation. When forests are destroyed, lakes and streams become shallow and impure, and wild life can no longer survive.

Good conservation practice necessitates the planting of enough new trees each year to supplant those which are removed. This means selective logging and the planting of new trees as the old ones are taken out.

Conservation can also be practiced through the better utilization of wood after it is grown. By-products of lumbering are utilized and smaller trees, once destroyed, are now being used. Wood is being preserved by the use of creosote and other preparations. Pennsylvania uses more than twice the amount of lumber she grows. The extra lumber is purchased chiefly from western and southern states.

THE FOREST

"The forest is a complex association of trees, shrubs, and other plants in which each individual growth plays some part in the life of its community."[20] The main value of the forest is in its timber. It is also important in the prevention of soil erosion and floods, provides shelter for wild life, and acts as a natural reservoir.

Pennsylvania has approximately 13,000,000 acres of forest land. Of these, 1,650,937 acres are State forests under the jurisdiction of the Department of Forests and Waters. There are 116 kinds of trees native to Pennsylvania.

Forestry, one of the youngest professions, applies the knowledge of tree growths, soils, spacing, planting, improvements and protection to timber production. It directs the forces of nature to fulfill man's needs.

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[20] *Illick, Joseph S., An Outline of General Forestry.* p. 26.

THE TREE, A COMPLEX PLANT

The tree is a woody plant exceeding ten feet in height, with a single stem unbranched for some distance above the ground. It is almost as complex as the forest itself. A living plant, it is comparable in many instances to man, and, like man, needs air, light, heat, water, and food for its proper growth. Its roots penetrate deep into the ground in search of food. The trunk carries the food to the crown, where the leaves combine it with elements from the air to form nourishment for the growing cells.

THE FOREST FLOOR

The floor is one of the most important components of the forest. A cross section of this floor appears as a number of layers of leaves, twigs, soil, humus, and litter in various stages of decomposition. Bacteria and insects live in these layers and hasten disintegration into rich soil.

This forest floor acts as a huge sponge, absorbing some of the rainfall and moisture for plant use, but allowing the remainder to drip slowly into springs and streams.

Individual demands on timber are not as great as they once were, but as a commodity, wood holds its own. These values may be lost through destructive lumbering, fire, tree diseases, and insect attack. Conservation study and practice, therefore, is of the utmost importance to citizens of Pennsylvania and other states.

IMPORTANCE OF WOODLOTS

Forests once covered almost half of the United States. Today there are less than 100,000,000 of the original 822,000,000 acres left in virgin timber, and over 85,000,000 acres are so denuded that they will not restock naturally. Woodlots—forests within forests—need special attention. They are not classified as forests, although forestry can be practiced.

No form of forest conservation is closer to home than that of the woodlot for the great body of Pennsylvania's school children. It

ourtesy of Pennsylvania Department of Highways.

Mountain laurel in Pennsylvania.

can be made a perpetual source of wood products if managed as a forest and not as a pasture. Grazing and fire destroy the young trees, flowers, and the homes of wild game and birds.

WOOD'S MANY USES

The wood of the forest has great value in communication systems, which use millions of telephone and telegraph poles. In transportation, it is used in automobile and carriage construction, and in railroad ties. Sawed timber or lumber is used more than any other material in manufacturing and building.

Other values in the forest include tree extracts, such as turpentine, paper, wallboard, cellulose products, dyes, medicinal compounds and chemicals.

Forest influences are both physical and social. The manufacture of forest products provides employment for many workers, while forest recreation makes living conditions more healthful and pleasant.

LARGER NURSERIES NEEDED

"The reforestation of 1,000,000 acres of what is now practically useless ground would mean planting 60,000,000 trees a year for twenty years. This replacement requires tremendous thought and work. Large-scale nurseries for seedling trees would have to be developed in Pennsylvania."[21]

"A forest tree requires from three to five years to grow one inch in diameter. Thirty to forty years are needed to grow wood for fence posts, forty to sixty years for telephone poles or railroad ties, and fifty to one hundred years, or more, for the fine-quality timber used to build houses or furniture. The tree-growing process is so slow that few citizens can be expected to undertake it. The Federal, State and county governments, however, can afford to plan far ahead for the welfare of their citizens."[22]

During the past thirty years, 54,750,000 trees have been planted in Pennsylvania State Forests. The average cost of planting an acre has been $10.02. As a consequence, there are approximately 39,573 acres of thrifty plantations in the State Forests. The trees planted are White Pine, Red Pine, Pitch Pine, Scotch Pine, Norway Spruce, White Ash, Red Oak, and others. Some of the older trees in these plantations are thirty to fifty feet high.

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[21] *Pennsylvania, an Inventory.* p. 54.
[22] *Ibid.* pp. 53, 54.

Under State ownership, barren wastes are rapidly becoming converted into productive forests. Where originally there were vast areas of cut-over and burned-over lands, there are now promising stands of thrifty trees.

More than 250,000 people and many industries already depend on Pennsylvania's State Forests for their water supply. Fifteen municipalities have more than fifty per cent of their watersheds located within these forests. Five districts, Chambersburg, Shippensburg, South Renovo, Waynesboro, and Mont Alto, have the impounding basins for their water supplies within State Forests. The water reservoir of Clearfield, though just outside the Meshanon State Forest, is fed entirely by water issuing from within the State-owned land.

FORESTS IN THIRTY-FOUR COUNTIES

The State Forests of Pennsylvania are distributed through thirty-four counties. They are located mainly in the mountainous regions of the Commonwealth, where the land is not fit for cultivation. Most of the forest land now owned by Pennsylvania lies within a belt that

Nursery, Clearfield State Forest, Clearfield County.

tesy of Pennsylvania Department of Forests and Waters.

extends entirely across the State, from Potter and Tioga Counties, on the north, to Fulton and Adams Counties, on the Mason-Dixon Line.

Outside this belt are detached areas of State forest land, some of considerable size. The largest of these special forest areas is in the Pocono region, in Pike and Monroe Counties. Here are located more than 66,000 acres of State forest. Another detached area in Somerset and Westmoreland Counties has 21,000 acres. Bedford County has more than 18,000 acres, and smaller units are found in several other counties.

NATURAL MONUMENTS

Natural monuments are those areas within the State Forests of unusual botanical or historic interest. Listed below are the ten State Forest Monuments, with a brief description of each.

Alan Seegar, Huntingdon County, State 305, near Detweiler Run. Named for a young American poet who lost his life in France during the World War.

Bear Meadows, in Centre County, on U. S. 322. A swamp of 350 acres. A botanist's paradise.

Bruce Lake, Pike County, State 390. Five hundred acres of wild land and lake area containing botanical specimens.

Detweiler Run, in Huntingdon County, State 305. A typical primeval forest; dense undergrowth of conifers, especially white pine and hemlock, rhododendron, and the hardwoods.

Joyce Kilmer, in Union County, State 45. Dedicated to the author of "Trees."

Martin's Hill, in Bedford County, State 326. One of the highest peaks in the State. There is a magnificent view from the observation tower.[23]

McConnel Narrows, Union County, State 888. This monument, located on the southern side of White Mountain, is covered with large white rocks that afford shelter to many wild animals.

Mount Logan, Clinton County, U. S. 220. It was named for the Indian orator chief, James Logan.

Mount Riansares, Clinton County, State 880. Named for the Duke of Riansares, the husband of former Queen of Spain, who

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[23] *Pennsylvania Has Everything.* p. 15.

Courtesy of Pennsylvania Department of Forests and Waters.

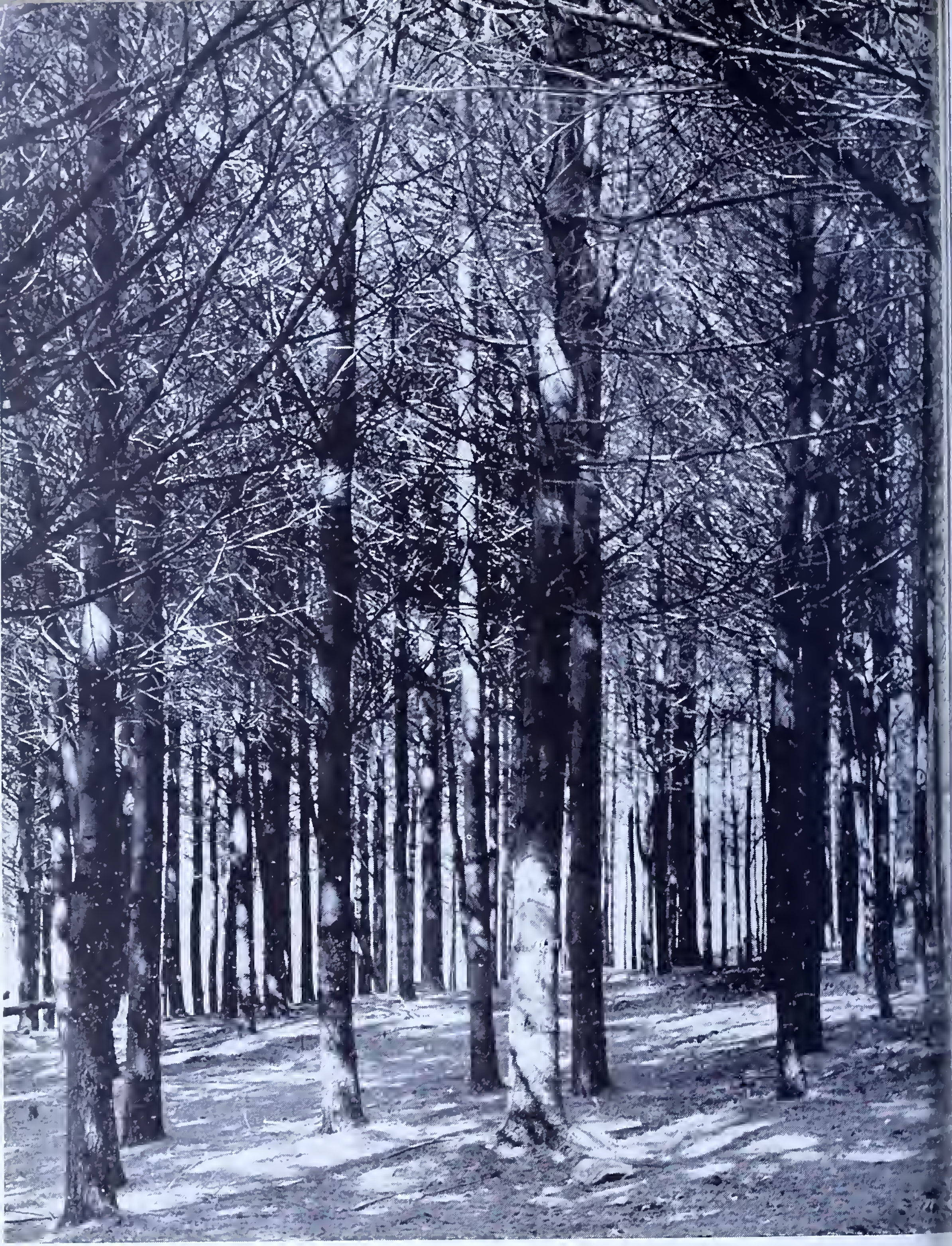
Camp site, Caledonia State Forest Park, Franklin County.

owned lands in Pennsylvania. She requested that the highest peak of her lands be named for him.

Snyder Middlesworth, Snyder County, State 929. One of the largest bodies of original timber within the State Forests of Pennsylvania.

HOW LAND IS PURCHASED

The purchase of forest lands is handled through the State Forest Commission of five members appointed by the Governor. The chair-



F. W. Ritter, Staff Artist.

Reforestation at White Pine Plantation, Caledonia, Pa.

man of the Commission is the Secretary of the Department of Forests and Waters. This Commission has formulated a forest land purchase policy, and acts upon each separate tract that is considered for purchase. The experience of thirty-five years has shown clearly that the Commission's policy gives the State the necessary protection against excessive prices and unethical practices, in the acquisition of forest lands.[24]

FOREST MANAGEMENT

To handle its forests properly and give assistance to private forest interests, the Department of Forests and Waters has divided the State into twenty-four forest districts, each of which is in charge of a district forester, assistant foresters, forest rangers, forest inspectors, and other employes.[25]

FIRE AS AN ENEMY

Fire, the mortal enemy of the forest, must be prevented through protection by public agencies, but this is only part of the program. Citizens who use the forests and woods must be educated in the use and abuse of fire.

A State-wide system of forest fire prevention is administered by the Bureau of Forest Protection of the Department of Forests and Waters. This bureau was organized in accordance with an act of the General Assembly passed in 1915. As late as 1913, less than half of the forest fires in Pennsylvania were reported to forestry officials. Today more than ninety-eight per cent of the fires in the State are reported promptly. Efficient and fully equipped fire crews are immediately dispatched to extinguish them.[26]

All district foresters and assistants are graduates of forestry schools of collegiate rank. In addition to the regularly employed personnel, several hundred temporary employes are engaged in forest protection, tree planting, nursery work, road and trail building, telephone line and tower construction, improvement cutting, and other forest operations.[27]

There are 4,000 volunteer forest fire wardens throughout Pennsylvania, paid on an hourly basis for time spent in the actual work of preventing, detecting, and suppressing forest fires.

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[24] *Illick, Joseph S. The State Forests of Pennsylvania.* pp. 20, 21.
[25] *Ibid.* p. 23.
[26] *Ibid.* pp. 46, 47.
[27] *Ibid.* p. 23.

"In each major type of forest activity, special studies have been initiated. More than 100 study plots have been established in the State forests, primarily for the collection of 'growth and yield' data."[28]

"To advance these special studies, the Pennsylvania Forest Research Institute was established at Mont Alto, Franklin County, as a branch of the Department of Forests and Waters. This is the first institution of its kind to be operated by a state department of forestry in America."[29]

Pennsylvania's forest-fire-fighting organization is built around technically trained foresters supported by trained crews of fire-fighters. To aid these important units, there are 145 forest fire observation towers in Pennsylvania, which, with a few exceptions, are built of steel on the highest mountains in Pennsylvania. Most of them are sixty feet in height, although some of the newer ones are eighty feet. These towers are connected with the headquarters of the local district foresters, and with various forest rangers, by more than 800 miles of State-owned telephone wires. Supplementing the towers in the task of suppressing forest fires are 4,000 miles of roads and 5,000 miles of trails in the forests.[30]

STATE'S PUBLIC PARKS

For its citizens, Pennsylvania has more than 42,000 acres of public parks owned by the State and Federal Government for camping, picnicking, swimming, hiking, hunting, fishing, and studying plant and animal life. If all the residents of Pennsylvania tried to use the public park space at the same time, there would be only a plot four feet wide by five feet long available for each person.[31]

"New parks are needed within easy distance of the large population centers. The State Parks, totalling 18,563 acres, are, for the most part, not accessible to the very people who need them most, the residents of the crowded city. With the advent of automobiles and good roads the use of the State Parks has increased from 500,000 visitors a year, in 1923, to from 3,000,000 to 4,000,000 people annually in recent years. This represents more than one-third of the State's population."[32]

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[28] *Ibid.* p. 80.
[29] *Ibid.* p. 80.
[30] *Ibid.* p. 51.
[31] *Pennsylvania, an Inventory.* p. 54.
[32] *Ibid.* p. 54.

Courtesy of Pennsylvania Department of Forests and Waters.

Coffee Rock Fire Tower, Clinton County.

HEMLOCK—THE STATE TREE OF PENNSYLVANIA

Pennsylvania is the only State in the Union that takes its name from the trees and forests—Penn's Woods. The hemlock tree became the official State Tree of Pennsylvania on June 22, 1931.

“Strong, sturdy, and beautiful, this tree belongs to the pine family. It is known as a conifer because the fruit is a cone. The leaves of the tree are needles forming a graceful and lacy effect. Recently it has gained popularity as a X-mas tree in this country. Full-grown hemlocks rise to a height of seventy-five feet in Pennsylvania, and their diameters vary from two to three feet. The wood is not strong, but hard, light in weight, stiff, and brittle. The bark is rich in tannic acid, important in the tanning industry, and very valuable commercially.”[33]

“A number of forest plantations of hemlock trees have been started in Pennsylvania, in regions where soil and climate are suited to their growth. More than 100,000 transplants raised in the four State Forest nurseries, managed by the Department of Forests and Waters, have been planted in the State Forests.”[34]

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[33] *Clepper, Henry E., Hemlock, the State Tree of Pennsylvania.* p. 19.
[34] *Ibid.* p. 5.

Sideling Hill Public Camp, Fulton County.

Courtesy of Pennsylvania Department of Forests and W

STATE FOREST RULES

1. No standing trees, young or old, shall be cut, shot at, barked or otherwise damaged or destroyed, except as necessary for the proper utilization of the forests, and with the advance approval of a forest officer.
2. Uncontrolled grazing by horses, sheep, cattle is prohibited, except by special permission, because it is injurious to young trees.
3. A permit is necessary to camp for two or more days, but none is required to camp overnight.
4. Streams and springs must not be polluted.
5. Forest fires must be prevented. No camp fires are permitted, unless proper precautions are taken to prevent their spreading to the forest. They must be extinguished immediately after use.
6. No advertisements are permitted in the State Forests.
7. All waste paper, empty cans, and other refuse must be buried, or otherwise disposed of by those who bring them into the forest.
8. Campers must observe, strictly, all fish and game laws.
9. The gathering of flowers of woody species is prohibited, except by permission of a forest officer.
10. For the preservation of fish life, and the comfort and consideration of campers, the use of motor-driven boats on lakes, ponds, and dams within the State Forests is prohibited.

Suggestions for Studies in Forest Conservation

1. Describe Pennsylvania's leading part in the forest conservation movement.
2. Students should plant trees, school forests, and take part in the creation of parks and bird sanctuaries. When possible, they should be organized in committees to consider certain problems assigned by the teacher, and cooperate with their local, county and state governments by serving as junior forest rangers and junior game wardens.

3. Review the forest as a community of interdependent trees, plants and animals.
4. How many kinds of trees in Pennsylvania? How can you recognize them?
5. Cooperate in Arbor Day and Bird Day programs of the State.
6. Discuss the depletion of our forest resources through the clearing of land for farms and through lumbering for wood products, timber, fuel, and pulp.
7. Prepare a list of State and National parks and forests in Pennsylvania.
8. Show the special significance of the farm wood lot and its conservation, and describe how it serves as a source of fuel, fence posts, poles, and ties; as a home for flowers, birds and game; as a beauty spot; as a control for erosion and flood.
9. Have a brief history written of Pennsylvania as a lumber producer.
10. Review lives of the great conservation leaders.
11. Scattered throughout Pennsylvania's forests are many interesting lessons in practical forestry, pointing the way to better forest practices. From these object lessons, the children of the State can learn helpful lessons in forest protection, forest tree planting, forest improvement work, and many other forest activities.
12. If a pupil wants to know how to plant forest trees, or what he may expect from them after they are planted, he can learn by visiting the State Forests. Here, too, he can learn how to fight forest fires, how to make improvement cuttings, how to build forest roads, how to control insect damage, and many other things it is necessary to know in order that he, now and in later life, may handle forest lands properly. In this connection, special demonstration areas may be visited. These areas of State Forest show what scientific forestry is and what it aims to accomplish.
13. Display pictures showing the results of forest fires and wasteful lumbering operations.

Films Available to the Classroom

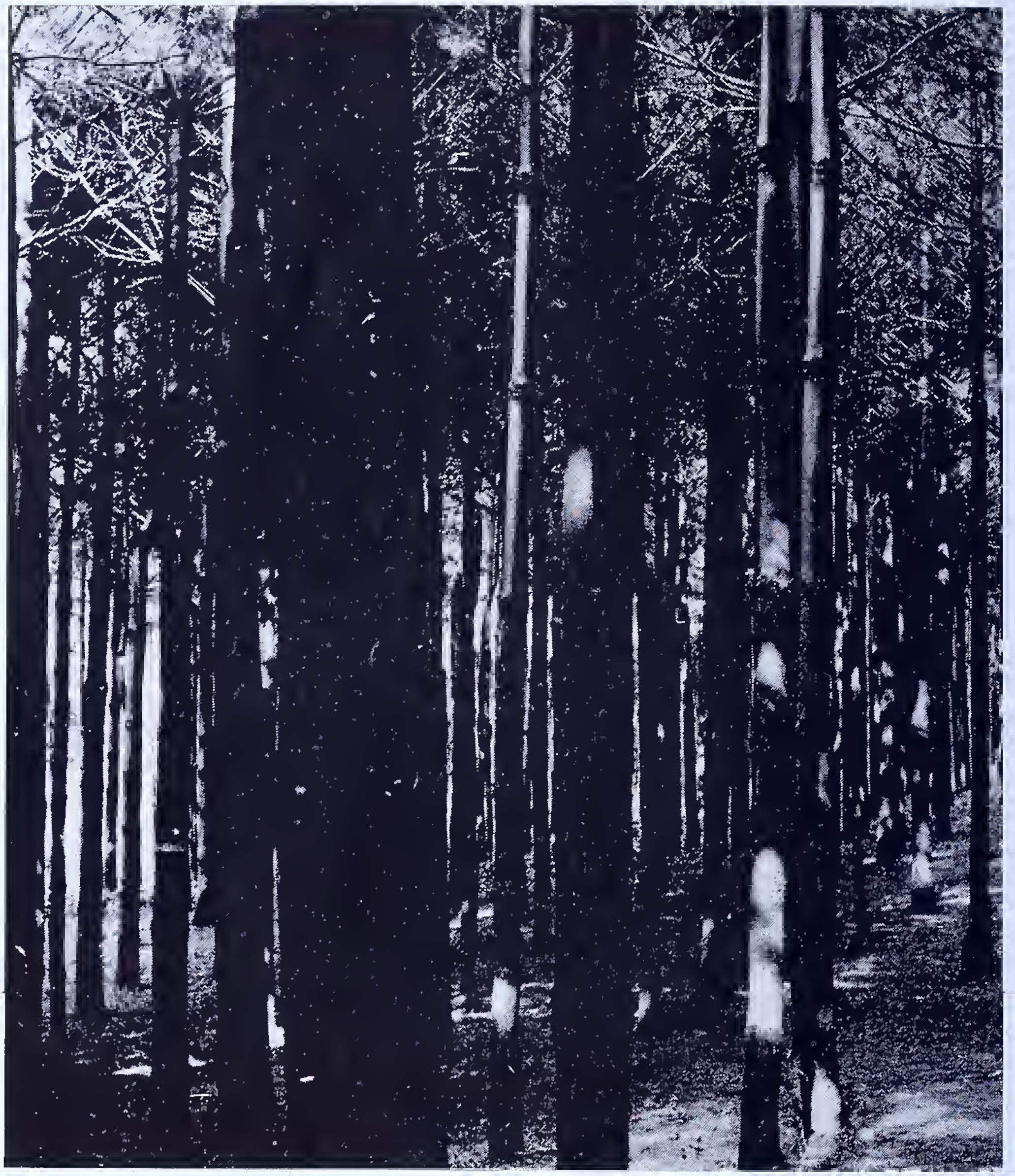
The films below can be obtained free of charge through the Division of Information, Pennsylvania Department of Forests and Waters. The borrower must pay the return transportation charge.

The Curse of the Forest	1 reel
The Story of a Pine Seed	1 reel
The Red Enemy	4 reels
New Forests for Old	1 reel
In Penn's Woods	3 reels
The State Forests of Pennsylvania	1 reel
Forests and Everyday Things	1 reel
Remembered Men in Penn's Woods	2 reels

Publications for the Classroom

The following publications can be obtained from the Pennsylvania Department of Forests and Waters:

1. *Forest Trees to Plant in Pennsylvania,*
   by Charles R. Meek, Silviculturist,
   Department of Forests and Waters.
2. *Hemlock, the State Tree of Pennsylvania,*
   by Henry E. Clepper,
   Department of Forests and Waters.
3. *Pennsylvania Forest Fire Warden Manual,*
   by George H. Wirt,
   Department of Forests and Waters.
4. *Forest Taxation in Pennsylvania,*
   by E. A. Ziegler,
   Department of Forests and Waters.
5. *Brush Burning,*
   by George H. Wirt,
   Department of Forests and Waters.
6. *The Deer Problem in the Forests of Pennsylvania,*
   by Henry E. Clepper,
   Department of Forests and Waters.
7. *Lessons in Forest Protection,*
   by George H. Wirt,
   Department of Forests and Waters.
8. *The Mont Alto State Forest Tree Nursery,*
   by Joseph S. Illick,
   Department of Forests and Waters.
9. *Railroad Forest Protection Conference,*
   Report of the Department of Forests and Waters.



Courtesy of Pennsylvania Department of Forests and Waters.

White Pine Plantation, Caledonia, Pa.

IV

CONSERVATION OF WILD LIFE

Pennsylvania's Abundance

WILD LIFE includes birds, animals, and fish, the creatures of field, forest, and stream, not domesticated by man. Pennsylvania, because of a wide conservation and restocking program, is blessed with a great abundance of such wild life.

Wild life management is a process of deliberate replenishing which produces and maintains wild animal population for recreational use. From the standpoint of the Pennsylvania sportsman and recreationist, the primary interest is in the production and preservation of game animals, birds, and fish in coordination with other natural resources.

Erosion control, forest and stream improvement, and fire protection have helped the cause of wild life reproduction. Many State and Federal agencies, foresters, conservationists, naturalists, and sportsmen are interested in game management that will provide for production of wild life in sustained crops for recreational use. The Citizens' Conservation Corps and other agencies have materially improved wild life conditions.

WILD LIFE DEPENDS ON PLANTS

"Climate and the rate of wild life reproduction determine the kinds of wild life found in a given spot. Equally important are the kinds of plants found in a given locality and the patterns by which plant growths are arranged. Wild life depends on plants for food and shelter; each species has certain definite plants and plant patterns, upon which it depends for its existence.

"We cannot change climate, but we can regulate killing and types of plants at a particular locality. The whole farm and forest conservation program includes manipulating the kinds and patterns of plant growths. Conservation of land animals consists in regulating the kill, and at the same time inducing the farmer and forester to consider the needs of animals. The conservation of fish likewise consists in regulating the catch, and preserving the plant life of waters."[35]

GAME FOOD AND COVER

"In the conservation of wild life the paramount need is food. This necessity is easily met in the summer seasons, but winter feeding has become a problem. The Pennsylvania Board of Game Commissioners has realized this situation and, through the Game Protectors and Refuge Keepers, constantly tries to add to the natural supply of food with grains placed in shelters. Sportsmen throughout the State are becoming more interested in the conservation of game, and are cooperating wherever possible."[36]

"The natural food supply is increased by two methods: first, by planting various shrubs, trees, vines, grains and grasses which will produce nuts, berries, and seeds; and second, by distributing grains, nuts, and dried plants. Wild grape, bittersweet and some briars should be planted along fence rows. A few rows of grain or corn stalks left standing after the harvest provide excellent food and shelter for birds and wild game. Evergreen plantations, which need not be more than 500 or 600 feet in width, are excellent havens of safety for small game. Many birds and animals relish the seeds from the cones of evergreen trees. Thousands of game animals and birds in Pennsylvania are fed each year with different kinds of grain, hay, and alfalfa distributed for that purpose. During the past few years this breeding program has been stressed by the Game Commission and assistance has been given by Boy Scouts, rural mail carriers, school children, organized and individual sportsmen, and farmers."[37]

Many different types of artificial feeding shelters can be built. One of the most successful feeding shelters being used is the "Hopper Shelter and Feeder." This combination shelter and feeder is supported, twenty-four to thirty feet above ground, by two trees, and holds a considerable amount of grain.[38]

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[35] *Callahan, John, Teaching Conservation in Wisconsin Schools.* p. 52.
[36] *More Food for Upland Game.* p. 4.
[37] *Ibid.* p. 6.
[38] *Ibid.* p. 24.

The wire basket feeder is a very satisfactory way of feeding turkeys, squirrels, and birds. It consists of a basket made in cylindrical form of one and one-half-inch mesh poultry wire, which is hung on a tree. This basket may be filled with ears of corn and the turkeys can peck the corn through the mesh, while the squirrels can get inside the basket.[39]

The suspended tray feeder is another easily constructed type. Care should be taken that they are placed above the reach of deer. These trays may be made any size and with a wire mesh bottom, so the grain can drop through. They may be suspended from trees or set up on posts.[40]

The spike pole feeder is useful and easily made. Poles with nails driven through with the spikes sticking upward are fastened six or seven feet above ground and ears of corn are stuck on these spikes. Discarded wagon beds, car bodies, bed springs, or old wire well covered with brush, all make good temporary retreats for wild game and birds. Instructions on making many types of feeders and shelters and on what to place in them are found in the free pamphlet, published by the Game Commission, entitled "More Food for Upland Game."[41]

School teachers, especially in rural districts, can readily apply these methods. Children should be taught that overgrown fence rows provide excellent feeding and nesting places for game and song birds, and that such food and cover should be saved, not cut away or burned. Many landowners today practice clean farming to such an extent that they drive away beneficial game and song birds. An afternoon spent in the fields and woodlands each week is the finest course of instruction in wild life conservation.

GAME CLASSIFIED

Game may be classified as big game, small game, furbearers, migratory fowl, and fish. Small game exists in virtually every section of the State. Small game management involves cover and habitat, feed, restocking, and legal protection. Big game management, on the other hand, is more complicated, although big game is not as abundant as small game. Big game requires large areas of forest or wilderness; proper and sufficient food; and protection from man, predatory animals, and disease. Other problems of big game management include prevention of overpopulation, transportation, and restocking.

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[39] *Ibid.* p. 26.
[40] *Ibid.* pp. 26, 28.
[41] *Ibid.* p. 30.

Carnivorous animals should be controlled rather than exterminated. Predators often prey upon other game, domestic stock and fowls; therefore their numbers must necessarily be kept low.

The problems in managing migratory fowl, mainly wild geese and ducks, are to provide preserves, breeding grounds, sanctuaries, refuges, and the introduction of food plants.

FISH MANAGEMENT

Fish management includes raising fish, stocking streams, improving streams for fish homes, and protecting fish. By nature and environment, most Americans are sportsmen. It was estimated in a Senate Committee Report on Conservation of Wild Life that from 1920 to 1930 the number of hunters and fishermen increased 400 per cent.

The Pennsylvania Fish Commission restocks streams with fish every spring and fall. These streams are stocked with small-mouth and large-mouth fingerling bass, two to eight inches in length, bullhead catfish two to ten inches, blue-gill sunfish two to eight inches, and trout six to fifteen inches in length, of the Rainbow, Brook and Brown variety. There are forty-four trucks, including ten tank trucks equipped with centrifugal pumps, used to carry these fish from the hatcheries to the streams. Pennsylvania has nine hatcheries located in different parts of the State: the Bellefonte Hatchery, in Centre County; the Erie Hatchery, Erie County; Corry Hatchery, Erie County; Torresdale Hatchery, Philadelphia County; Reynoldsdale Hatchery, Bedford County; Huntsdale Hatchery, Cumberland County; Tionesta Hatchery, Forest County, and the Pleasant Mount Hatchery, in Wayne County, the latter being one of the largest hatcheries in the United States.

BETTER HABITATS SUGGESTED

Game would be distributed over all available areas, instead of being heavily concentrated in a few sections, if an ideal conservation program for wild life could be effected and followed. With ade-

rtesy of Pennsylvania Department of Forests and Waters.

Rainbow Trout at State Fish Hatchery, Centre County.

quate food and protection, and a regulated kill based upon optimum population, sufficient quantities of wild life would be made available for various forms of recreation in Pennsylvania and other states.

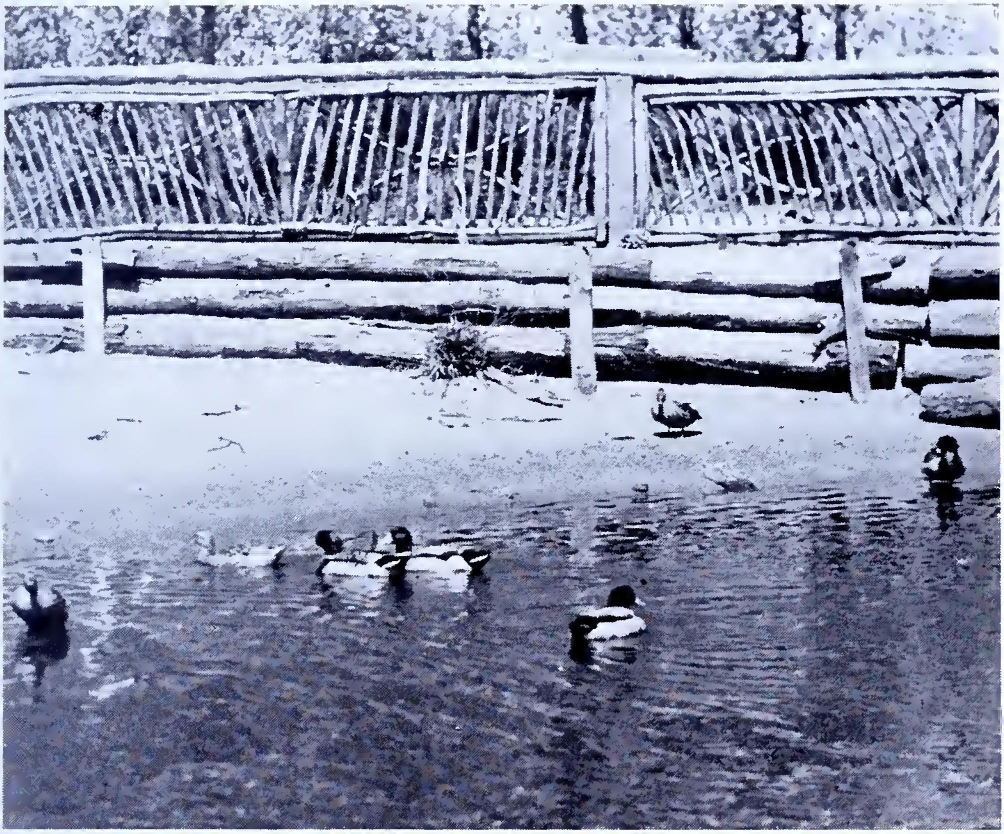
For every variety of song bird, game animal, furbearer, and fish, there is a way to provide, somewhere in Pennsylvania's farms and forests, a better habitat at negligible cost.

Bird house building is a practical conservation project which can be readily and easily applied in any school. In vocational schools particularly, students studying cabinet making could, as a community gesture, build several hundred bird houses for use in city or town parks, or in their own backyards. In other schools the boxes could be built as a part of a conservation unit system set up by the teacher. Teachers are urged to institute a bird house building program in their conservation curriculum.

GAME REFUGES

About forty years ago the fish and wild animals of Pennsylvania were disappearing as rapidly as were the forests. Thinking only of their immediate catch, greedy hunters and fishermen ignored the need of the future. The State took cognizance of the crisis, and to keep wild life from being wiped out, passed laws prohibiting wholesale slaughter and establishing State game refuges for the protection and breeding of animals.

There are 132 primary State game refuges on State game lands, eighty-one in State and National forests, and sixty-five auxiliary refuges. There are forty-one cooperative farm game projects, with 452 game refuges on these projects alone. Thousands of ringneck pheasants, bobwhite quail, and wild turkeys are propagated on these State game farms and released in depleted areas of the Commonwealth to supplement the native supply. Ringneck pheasants are the most popular by far, as these birds lend themselves exceptionally well to artificial propagation. Pennsylvania has four game farms from which shipments are made for restocking purposes. These farms are: the Fisher Game Farm, in Montgomery County, that raises ringneck pheasants and quail primarily; the Jordan Farm, in Lawrence County, raising ringneck pheasants only; the Loyalsock Farm, in Lycoming County, ringnecks and quail; and the State Wild Turkey Farm, in Juniata County, for wild turkeys only. The Fisher and Loyalsock farms are also experimenting in raising Hungarian and Chukar partridges, both imported birds. A training school is located at Brockway, Jefferson County, the first in the world, to train officers in this special work.



C. H. Brown, Staff Artist.

Wild duck in Presque Isle State Park, Erie County.

A PARADISE FOR SPORTSMEN

With the exception of isolated tracts set aside as game refuges and as recreational centers, Pennsylvania has made available to hunters an area of more than 1,500,000 acres. It is interesting to note that although the State Forests comprise only about one-eighth of the wild land of the State, yet more than one-half of the deer and one-third of the bears killed in Pennsylvania are found in the State Forests. They also supply large quantities of small game.

Some of the finest trout streams in the East flow through Pennsylvania's forest land. The Department of Forests and Waters has been making constant efforts to improve the streams by the building of dams, erection of barriers, and other artificial means to aid in the propagation of fish.

Courtesy of Pennsylvania Department of Forests and Waters.

Trailside Shelter, Mt. Alto State Park, Franklin County.

The development of roads within the State Forests by the CCC is a help to hunters and fishermen. The road and trail development program of the Pennsylvania forest service is opening vast areas of forest lands, that were formerly inaccessible, for hunting and fishing.

CAMP SITES

The Pennsylvania Department of Forests and Waters is permitted by State law passed March 27, 1913, to lease small parcels of State Forest land to residents of Pennsylvania for health and recreation. The leases are limited by the law to ten years, and by policy to an area usually not exceeding one-fourth of an acre. The number of sites increased from thirty-seven in 1914, to 1,122 in 1924, and to approximately 3,000 at the present time.[42]

Formerly these camp sites were used principally by hunting and fishing parties. In recent years an increasing percentage are used for summer homes. Thousands of Pennsylvanians are thus enabled to enjoy the beneficial influence of a forest environment during the summer season at a moderate cost.

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[42] *State Forest Camp Sites in Pennsylvania.* Pennsylvania Department of Forests and Waters. p. 3.

ROLE OF SCHOOLS

Among the contributions of Pennsylvania's schools in encouraging the preservation of wild life are Arbor Day and Bird Day activities. State courses of study in science constantly stress the importance of conservation of birds, animals, fish, trees, and other resources. The courses also emphasize the need for extension of these resources.

In these programs, stress is placed upon the aid birds render to mankind, and the importance of protecting our native flowers. The primary purpose of the Arbor Day and Bird Day program is to give pupils a friendly and appreciative feeling for trees, flowers, birds, animals, and fish, and to stimulate them to protect and defend all that is useful and beautiful.

The future of wild life, after all, lies not so much in the hands of legislators and statesmen as in the hands of our young men and women.

HONOR CODE OF THE WOODS AND WATERS

First of all, "play fair" with all outdoors. Be a real sportsman to all the world, whether man, beast, bird, or flower.

Have a proper contempt for the killing of wild life for sale, and refuse to buy wild game or trophies displayed in the markets. A true sportsman kills his own game, and then only for himself and family.

No matter how much fish or game the law allows as a bag limit, take no more than you can use and conserve something for another day.

Never pull wild flowers recklessly just to let them wither and be thrown away. Never be such a "poor sport" as to gather wild flowers for sale.

Never rob a bird's nest, since this act is both cruel and unfair.

Be careful never to do anything that may start a forest fire. It kills valuable timber which will take many years to grow again. It also spoils and destroys the cover and protection of birds and wild animals.

Never fish or hunt on farm lands without the owner's permission. Never leave gates open, injure the farmer's cattle, shoot near his house or stock, take his fruit, or trample his crops. Not only respect the farmer's rights yourself, but report to him and assist him in bringing to justice anyone who breaks the law.

Never, under any circumstances, shoot until you see clearly what you are shooting at, and that you are in no danger of shooting any human being.

Rainbow Trout, Pleasant Gap Hatchery, Centre County.

Courtesy of Pennsylvania Department of Forests and Wat

Obey all laws, whether you think they are reasonable or not. Laws are "the rules of the game" that men have worked out by their experience in trying to live together in society. Though you may think it would improve the game if some of the rules were changed, be sportsman enough "to play with the team."

Outline of Suggestions for Wild Life Study in the Classroom

1. Discuss the Honor Code of the woods and waters prepared by the Pennsylvania Game Commission.
2. Review with the class the life of John Muir, the great naturalist and conservationist, the centennial of whose birth was April 21, 1938. He had a passionate love of wild places and wild creatures. Small scenes, sketches, or posters can be constructed to show experiences he had as a boy.
3. Encourage children to plant trees, build a protective fence around a patch of violets, or set out some elder or wild-plum shrubs for food or protection of birds.
4. Observe Arbor and Bird Day with special programs.
5. Wild life conservation activities begun in the spring should have the attention of the teacher or a few responsible pupils during the summer vacation and should be continued from year to year if possible.
6. Discuss reasons for scarcity of plants and flowers that are listed as needing protection in "Preservation of Wild Flowers," published by the State Department of Agriculture.
7. If there are woods, fields, and a stream near the school, the instructor and children might secure permission to establish a trail there, placing placards and signs to help nature lovers and hikers in finding beauty spots more easily.
8. Tell the story of the extermination of the bison or of the passenger pigeon, as examples of the extermination of animals and birds.

9. Encourage pupils to locate wild flowers, to identify the flowers, and to study their habits. Haunts of wild animals and birds can be found by the class. The children can also be taught to observe unusually graceful and symmetrical trees.

10. Conservation of birds especially appeals to children. A corner of the schoolyard can be made into a bird sanctuary with shrubs and trees, a bird bath, and feeding station. Built-in shelters give additional protection from storms, and cold winds in winter.

11. Teachers and pupils in the rural sections can secure permission to fence a small gully near the school and to plant vines, trees, and shrubs which thrive in the vicinity. These prevent the gully from increasing in size, and also afford food and protection for birds and small wild animals. Larger boys can learn to build small dams to help control the gully if necessary.

12. What is the State Bird? The State Tree? The State Flower? Why were they chosen? What do they symbolize?

13. Relate the economic value of birds in destroying insects and pests.

14. Tell stories about our wild creatures in relation to their value to mankind.

15. Make a special effort to train the children to detect birds by their song as well as by their appearance.

16. Study migration of birds, and the science of bird banding.

17. Teach the children that, in general, autumn flowers may be picked more freely than spring flowers. Coarse plants are less in danger of extinction than delicate ones and lend themselves better to decorative purposes.

18. Plants growing in the woods should be admired and left for some one else to enjoy, while those in open places, especially in cultivated fields, may more often be picked.

Films Available to the Classroom

The following is a list of films available to schools and other organizations interested in the conservation of wild life. These films are free, providing a projector and operator are furnished. They may be obtained from the Pennsylvania Game Commission.

NEW 16MM AND 35MM REELS (1938)

Farm Game No. 1

(A pictorial explanation of the system employed in the development and maintenance of the rapidly spreading and highly successful Farm Game Refuge Program.)

Farm Game No. 2

(An enjoyable sequel to Farm Game Reel No. 1 in which you follow two sportsmen and their English Setters on a pheasant hunt on a Farm Game Area.)

A Day Behind the Beagles

(As its title infers, a real rabbit hunt with real dogs and two real enthusiasts. Excellent dessert to top off a full course meeting.)

Raising Ringneck Pheasants

(You are taken behind the scenes and into the detailed workings of our State Game Farms where the story of pheasant propagation is unfolded before your eyes.)

Quail and Turkey Propagation

(Similar in some respects to the Ringneck reel, the inside story of the quail and turkey propagation activities of the Pennsylvania Game Commission.)

Huns and Chukers in Pennsylvania

(A brief but enlightening history of the Game Commission's experiments in introducing two "foreign gamesters" to the Keystone State.)

Intimate Views of Pennsylvania Birdlife

(An unusual collection of song bird portraits, highly educational.)

Winter Feeding

(An abbreviated story of the care of our game during their hardship months.)

Wildlife Shots at Random

(A miscellaneous collection of game animals and their activities.)

Woodland Orphans

(Intimate pictures portraying the unfortunate practice of taking woodland youngsters into the private home. A short reel deserving of considerable stress.)

Publications Available to the Classroom

The following list of publications may be obtained from the Pennsylvania Game Commission:

Pennsylvania Game News—Monthly Magazine—Subscription per year	50 cents
Bulletin No. 10—Game Administration in Pennsylvania	10 cents
Bulletin No. 14—State Game Refuges and Public Hunting Grounds	10 cents
Bulletin No. 15—An Introduction to the Mammals of Pennsylvania	10 cents
Bulletin No. 17—Pennsylvania Bird-Life	10 cents
Bulletin No. 11—More Food for Upland Game	FREE
Bulletin No. 16—Wild Life in the Farm Program	FREE
Artificial Incubation and Brooding of Ringneck Pheasants	FREE
Hatching and Rearing Ringneck Pheasants	FREE
Pennsylvania Game Laws	FREE
The Pennsylvania Bounty System	FREE
The New Sportsman's Game Propagating Pen	FREE
Management of the Cottontail Rabbit in Pennsylvania	FREE
A Game Restoration Job for Everyone	FREE
Pennsylvania's Farm-Game Refuge Program	FREE

V

CONSERVATION OF MINERALS

Their Supply Limited

"MINERALS are a 'one crop resource.' Their supply is limited by nature, they are exhaustible, fixed in amount and distributed very unevenly over the world. The United States has a greater variety of minerals than any country in the world, but is short of tin, nickel, manganese, chromite, and antimony."[43]

Pennsylvania is a famous industrial State chiefly because of her minerals. The Commonwealth has long led all other states in mineral production. Coal, cement, natural gas, and petroleum, in order of value, are the principal sources of Pennsylvania's mineral wealth.

Geologists predict that the State's valuable oil and gas resources, at the current rate of use, will be exhausted in about 100 years, as will the thicker beds of coal, which alone can compete with coal being mined in other states. This period could be measurably lengthened by the wise practice of conservation and improved mining methods.

PENNSYLVANIA'S MINERALS

Structural materials abundant in Pennsylvania include clay, slate, stone, cement, sand, and gravel. As the mineral fuels, coal, oil and gas, provide heat and power, so the structural materials are used to construct modern roads and buildings.

The Commonwealth has built her industries largely on these basic elements. She produces nearly one-half the steel of the country, shipping to all parts of the world. Pennsylvania's output of iron, steel, and coal has at times been greater than that of any nation. Pittsburgh, the greatest metal producing center in the world, gets its supply of iron ore mostly from Minnesota.

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[43] *Callahan, John, Teaching Conservation in Wisconsin Schools.* p. 34.

The supply of building materials such as stone, sand, clay, and lime, is so large that there need be little worry about exhausting it. Some materials can be used more than once. Stone from old buildings is often used in new ones, but in spite of the large supply, local shortages often occur. Since all sections do not have an ample supply of building stone, lime, or even gravel, each locality should carefully consider the best use to be made of whatever is available. The problem of conservation is to prevent their waste.

SALVAGEABLE MINERALS

"Minerals such as iron, copper, lead, zinc, gold, and silver, are exhaustible so far as the supply below the earth's surface is concerned. Certain copper and iron mines have already been exhausted. In other cases the ore is so poor, or lies so deep, that it does not pay to work the mine any longer. The minerals of this group, however, tend to accumulate above ground, since they can be re-used, although there is some loss. For instance, iron rusts, but on the whole, the usable supply tends to increase. About half of the iron and steel made today comes from scrap metal, and large quantities of copper, lead, zinc, tin, and antimony are recovered from old materials. If our population becomes stationary, it is conceivable that civilization can exist indefinitely by merely replacing the lost and worn-out metals."[44]

MINERALS DESTROYED IN USE

"Pennsylvania, however, finds the situation highly problematical in the group of minerals which are destroyed by their use, such as coal, petroleum, and natural gas. Also in this group are the fertilizer materials. Their supply, however, is large, and some of them can be obtained by utilizing by-products, postponing their depletion indefinitely.

"About one-third of the nation's anthracite is gone and the cost of mining the inaccessible layers is very high. The best seams of bituminous coal will show definite increases in costs of production within thirty years.

"The object of conservation is to avoid wastes in mining and in use of coal by the consumer. The former is extremely difficult as long as 6,000 mines located in thirty-one states are in direct competition with each other. Natural gas and petroleum, exhaustible resources have also been depleted rapidly through flagrant waste."[45]

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[44] *Ibid.* pp. 34, 35.

LAWS AND FUTURE SUPPLIES

"If proper laws are enacted to prevent the wasteful exploitation of gas and oil, it will mean reducing the present supply, so that there may be oil in the ground for our children and grandchildren. This will mean, in part, the use of abundant fuels such as coal in place of the less abundant oil and gas. A smaller supply today may mean a higher price. The true test of the conservationist is whether he will be willing to pay more for the use of natural resources now in order that future generations may enjoy them also.

"Believing that new oil fields will be discovered, or that substitutes will be found, most people prefer to use resources lavishly, letting the future take care of itself.

"Water power is one substitute for coal, gas, and oil, but it is limited. All three resources are highly important for heating and smelting, and water power cannot readily be substituted for gasoline in automobiles and trucks, even when converted into electricity.

"With one-seventh of all the nation's mineral production to her credit, Pennsylvania leads all states except Texas in mineral resources, but since many of her best mines, which have been worked for years, are becoming exhausted, the Commonwealth's leadership has been weakening. Other states, meanwhile, are developing new mines and are favored in the West and South by the present system of railroad freight rates."[46]

"Geologists estimate Pennsylvania's single iron mine will be worked out in a century. However, some of her poorer iron deposits, which are not in operation at present, may be mined again when other states have used up their first-grade ores."

IMPROVED MINING SOUGHT

"Engineers are endeavoring, meanwhile, to devise better and more efficient mining methods in order to postpone the exhaustion of Pennsylvania's important mineral supplies.

"Driven by competition with each other, and with rivals in other states, the operators of Pennsylvania coal mines and oil fields have for years tended to produce more than the public requires. A search for new supplies usually followed depletion in the old days. Today, geologists say, after thorough study of Pennsylvania's land and rocks, that it is not probable that any important new mineral deposits will be found within the State. Pennsylvania, therefore, can retain her traditional leadership in the mineral industries only by careful conservation and by the development of more efficient methods.

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[45] *Ibid.* p. 35.

[46] *Pennsylvania, an Inventory.* pp. 60, 61.

"It is imperative that the State follow such a conservation program, since the falling off of the mineral industries, such as coal and iron, has been responsible for a great part of the unemployment and economic distress in Pennsylvania during the last few years."[47]

Remembering that a large part of our great iron industry, and therefore, of our manufacturing industries are in Pennsylvania because of the presence of high-grade coal and oil, exhaustion of the commercially usable deposits of these resources is likely to be followed by an exodus of these industries to other states. It is necessary, therefore, that the State take such measures as will best conserve these resources.

STATE LEADS IN COAL

"It is estimated that more than 10,000,000,000 tons of coal have been mined in Pennsylvania. More than 50,000,000,000 tons of coal may still be mined.

"The State is particularly famous for its hard coal. Mines covering nearly 500 square miles in Lackawanna, Luzerne, Carbon, Schuylkill, Northumberland, and Dauphin Counties produce more than nine-tenths of all the anthracite coal in the United States. Their annual production is over 50,000,000 tons.

"Bituminous, or soft, coal is more abundant. Bituminous mines are more numerous than anthracite, and are found in twenty-eight counties in western Pennsylvania. Anthracite coal is usually sold for two and one-half times the cost of bituminous, which is used more generally as a source of power than for heating purposes. More than 100,000,000 tons of bituminous coal are produced in a single year in Pennsylvania mines."[48]

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[47] *Ibid.* p. 61.

[48] *Pennsylvania, an Inventory.* p. 61.

NEW DEVICES HALT WASTE

New devices are making the use of coal more efficient and economical. Ways have been developed to use coal dust and the small sizes of coal which formerly were wasted. Automatic stokers and ash removers are making it possible for furnaces to be operated almost without human labor, while many new mechanical devices are being used in the mines themselves to cut down increasing production costs.[49]

In addition to direct use as fuel, or for power, bituminous coal has many important by-products. They include coke (a light, porous smokeless fuel), gases, and liquids. From the gases, most of our cooking and heating gas is manufactured. Ammonia, tar and dyes are among the other valuable by-products of coal.[50]

PENNSYLVANIA OIL

"The early oil production of the country was centered in western Pennsylvania. A well drilled at Titusville, Pennsylvania, by Col. Edwin L. Drake, proved to be the start of the oil industry in this country. Drake struck oil on August 27, 1859. The early oil drillers wanted kerosene, widely used at the time for lighting and heating. No use had been found then for gasoline, used now in automobile engines and other motors.

"Gasoline, a fairly recent discovery, is refined from petroleum. Pennsylvania produces about one-sixtieth of the nation's petroleum, but because of its high quality, this contains about eight times as much lubricating oil as does the average petroleum found in other parts of the country.

"Practically all of Pennsylvania's oil is produced in half a dozen northwestern counties at the rate of between 15,000,000 and 20,000,000 barrels a year. The State's oil production would now be nearly exhausted, if engineers had not devised new ways of recovering oil from the earth by high pressure. Even with this method, in one field more than half of the existing oil remains in the ground. If better methods are devised for recovering the great quantities of oil still in the earth, the final exhaustion of Pennsylvania's oil fields can be postponed."[51]

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[49] *Ibid.* p. 64.
[50] *Ibid.* p. 65.
[51] *Ibid.* p. 65.

REFINING EXCEEDS PRODUCTION

Pennsylvania refines about four times as much oil as she produces. The crude oil she refines is brought in by pipe lines or oil tankers from other states or countries to Pennsylvania refineries. The refining process includes heating, cooling, and separation, by which gasoline, lubricating oil, fuel oil, kerosene, paraffin, naphtha, benzine and other products are each drawn in turn from the original crude oil.

Many experiments are being made to find ways to make motor fuel from sources other than oil, such as coal, shale, and vegetable matter. Oil engineers predict that by the time the country's supply of petroleum is finally exhausted, substitutes will be available.[52]

GAS FOR LIGHT AND FUEL

"Gas seeping from the early oil wells interfered with the work of the drillers. It was not considered of commercial value. In 1883, its utility value was recognized and pipe lines were laid to nearby cities. The chief defect of natural gas, as compared with gas made from coal as a by-product from coke ovens, is that the supply is not always uniform and may fail quite suddenly when particular sources are exhausted. How long Pennsylvania's natural gas will continue to flow is problematical. Some geologists estimate flow for 100 years; others predict exhaustion of the supply in a shorter time.

"The State's natural gas fields are scattered thickly in a belt that extends from the southwestern corner of Pennsylvania to McKean and Tioga Counties, in the north. An annual flow of nearly 100,000,000,000 cubic feet of gas comes from the numerous wells of the State. At one time considered merely an annoyance, the flow is now considered of greater value to the industry than petroleum itself.[53]

LIMESTONE

Not only able to fill its own needs for lime, glass, stone, brick, cement, slate, plaster and asbestos, Pennsylvania also ships large quantities of such products as cement, lime, glass, and slate to other states.

Pennsylvania produces more limestone than any other state except Ohio. Limestone is used to make cement, plaster, concrete, and glass. It is also used for fertilizer in farming districts, and in the preparation of many products, including paper, metal, glass, leather, and sugar.

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[52] *Ibid.* p. 67.
[53] *Ibid.* p. 67.

A special type of limestone is used to make Portland cement. The limestone is crushed, roasted, and mixed with other materials, and the resulting cement is used to build concrete highways, streets, sidewalks, and buildings. This early industry of Pennsylvania still produces about one-fifth of all the country's cement.[54]

SLATE

Pennsylvania also leads as a slate producer. Slate is a tough rock used to make fireproof roofs and blackboards for schools. It is found in larger quantities in the Lehigh Valley section of the State than in any other part of the United States. Other kinds of building stone are also quarried in many parts of the State.[55]

CLAY

In clay production, as in limestone, Pennsylvania ranks second only to Ohio. Many millions of dollars worth of products are manufactured from clay in Pennsylvania annually, including brick, tile, terra cotta, sewer pipe, and firebrick. Little of Pennsylvania's clay is suitable for making china and pottery. However, processes might be developed to remove some of the impurities, widening the range of its use.[56]

GLASS

Glass is another mineral product in which Pennsylvania specializes, producing about one-fourth of the nation's glass. In addition to its value in modern building construction, Pennsylvania's glass is used in making bottles, jars, and tableware. In recent years machines have replaced most of the skilled glass blowers. Plate glass is made by heating, melting, and mixing such opaque materials as limestone, salt cake, and quartz sand. These materials are almost inexhaustible.[57]

IRON AND STEEL

Although Pennsylvania produces very little of its own iron ore, it leads the nation in the production of iron and steel, and the United

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[54] *Ibid.* pp. 67, 68.
[55] *Ibid.* p. 68.
[56] *Ibid.* p. 68.
[57] *Ibid.* p. 68.

States leads the world. Without iron and steel, the foundations of modern industrial progress, we would not have railroads, automobiles, giant ships, towering buildings, or telephones. The iron and steel industry of the State involves an annual business of nearly $2,000,000,000.[58]

The State remains the center of the iron and steel industry because of her abundant supplies of the coal and limestone needed to transform iron ore into pig iron, cast iron, wrought iron, or steel, and because of her convenience to the most important markets. Pennsylvania, however, may soon lose this leadership, since modern methods make it less necessary for iron and steel plants to be located close to coal sources.[59]

Classroom Approaches in Study of Minerals

1. Discuss Pennsylvania's leadership in mineral production.
2. Prepare histories of various mineral resources in Pennsylvania.
3. An essay may be written on the exploitation of Pennsylvania's coal resources and its relation to the State's social and economic welfare.
4. Survey conservation practices necessary to minimize waste in mining of coal and in use.
5. Discuss with class the need for conservation of petroleum; its importance to the State, to National welfare, and to economic security.
6. Consider the uses and waste of natural gas, and the necessity for conservation.
7. Review the uses of Pennsylvania's mineral resources for building material and for construction of highways.
8. What does an inventory show to be Pennsylvania's present stock of mineral resources? Which of them do we especially need to conserve?
9. Explain the three kinds of minerals, fuels, metallics, and non-metallics.

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[58] *Ibid.* p. 68.
[59] *Ibid.* p. 68.

10. Arrange a class debate on this topic: Resolved, That the conservation of mineral and other natural resources is a duty incumbent upon each generation.

Films Available to the Classroom

The following list of films can be obtained from the Bureau of Mines, United States Department of the Interior, Washington, D. C. There is no rental charge, but the borrower must agree to pay transportation costs both ways and supply both operator and projection machine.

Coal

The Making of a Safe Miner	2 reels
Oxygen Breathing Apparatus	1 reel
"Wildwood," a 100-Per Cent Mechanized Mine	3 reels

Oil

The Story of Gasoline	2 reels
Through Oil Lands of Europe and Africa—Germany, France, Spain, Morocco, and Algeria	2 reels
The Story of Lubricating Oil	2 reels
Refining the Crude	4 reels
The Evolution of the Oil Industry	3 reels
Petroleum, the Liquid Mineral	4 reels

Power

Water Power	2 reels
The Story of Power	3 reels

Safety

Twelve Points of Safety	1 reel
Carbon Monoxide: The Unseen Danger	1 reel
Learn and Live—Value of First Aid	1 reel

Steel

The Story of Steel—Mining, and the Making of Pig Iron and Steel Ingots	2 reels
The Story of Steel—Manufacture of Rails, Plates, and Other Hot-Rolled Products	1 reel
The Story of Steel—Manufacture of Wire Products Made in Cooperation with the United States Steel Corporation	1 reel
The Story of Steel—Manufacture of Pipe	1 reel
The Story of Steel—Manufacture of Steel Sheet and Tin Plate	1 reel

Cement

From Mountain to Cement Sack	1 reel
Construction that Endures	1 reel

Publications for the Classroom

The following group of bulletins and pamphlets are available from the Bureau of Mines, U. S. Department of the Interior. All books are free except where a charge is shown.

B 6. *Coals Available for the Manufacture of Illuminating Gas,* by A. H. White and Perry Barker, compiled and revised by H. M. Wilson. 1911. 77 pp., 4 pls., 12 figs. Gives tests of coals from Blocton, Ala.; Oak Creek and Sopris, Colo.; Harrisburg, Ill.; Heller, Ky.; Saginaw, Mich.; Van Houton, N. Mex.; Scott Haven, Pa.; La Follette, Tenn.; Page, W. Va., and Hanna, Wyo.

B 17. *A Primer on Explosives for Coal Miners,* by C. E. Munroe and Clarence Hall. 1909. 69 pp., 10 pls., 12 figs. Discusses combustion and explosion, the composition of explosives, the handling and use of explosives and of squibs, fuses, and detonators, and concludes with notes on the safe shipment and storage of explosives and the requirements of permissible explosives. Reprint of Geological Survey Bulletin, 423.

B 20. *The Explosibility of Coal Dust,* by G. S. Rise, with chapter by J. C. W. Frazer, Axel Larsen, Frank Haas, and Carl Scholz. 1911. 204 pp., 14 pls., 28 figs. Gives a resume of existing knowledge regarding the explosibility of coal dust suspended in air. Is written for the information of officials of coal mining companies and of persons investigating the properties of coal dust. Treats of the growth of the coal-dust problem in Europe and in this country, the factors that govern the explosibility of coal dust, and the remedies that may be applied in mines to render coal dust harmless. Revision of Geological Survey Bulletin, 425. 35 cents.

B 25. *Mining Conditions under the City of Scranton, Pa.* Report and Maps, by William Griffith and E. T. Conner, with a preface by J. A. Holmes and a chapter by N. H. Darton. 1912. 89 pp., 29 pls. Gives results of an investigation undertaken to determine the probable danger from subsidence of the surface through the removal of coal from the various beds underlying the city. Shows by large-scale maps the extent of the workings in each bed. Discusses various methods for supporting the roof and commends the flushing of sand or other material from the surface.

B 47. *Notes on Mineral Wastes,* by C. L. Parsons. 1912. 44 pp. Reviews the more important losses in the treatment and utilization of minerals, ores, and metals; discusses new sources of supply and the probable development of new uses.

B. 57. *Safety and Efficiency in Mine Tunneling,* by D. W. Brunton and J. A. Davis. 1914. 271 pp., 6 pls., 45 figs. Discusses selection of power, surface, and underground equipment; methods of drilling, blasting, and mucking; and the causes and prevention of accidents. Gives a review of the history of tunneling and a bibliography of the more important literature.

B 87. *Houses for Mining Towns,* by J. H. White. 1914. 64 pp., 8 pls., 9 figs. Treats of plans for and arrangement of mining towns and the construction of houses and briefly discusses water supply and sewage disposal. 15 cents.

B 106. *The Technology of Marble Quarrying,* by Oliver Bowles. 1916. 174 pp., 12 pls., 33 figs. Summarizes efficient and economical methods of quarrying and preparing marbles; describes special and improved machinery and equipment, and points out the need of better systems of cost keeping.

B 218. *The Technology of Slate,* by Oliver Bowles. 1922. 132 pp., 6 pls., 41 figs. Points out the most efficient methods and equipment in use in slate quarries, describes methods of utilizing the quarried material to best advantage, and outlines means to reduce the proportion of waste. 20 cents.

B 228. *Estimation of Underground Oil Reserves by Oil-Well Production Curves,* by W. W. Cutler, Jr. 1924. 114 pp., 2 pls., 26 figs. Discusses production-decline curve method for estimating recoverable underground reserves of oil and its use for solving operating problems. 20 cents.

B 229. *Fifty-Nine Coal-Mine Fires; How They Were Fought and What They Teach,* by G. S. Rice, J. W. Paul, and M. W. von Bernewits. 1927. 156 pp., 61 figs. Covers a period of 16 years. Discusses practical methods of fire fighting in widely separated mines that differ greatly in underground conditions and range from anthracite to lignite mines. Suggests means to prevent mine fires.

B 269. *Quarry Problems in the Lime Industry,* by Oliver Bowles and W. M. Myers. 1927. 93 pp., 34 figs. Describes general methods of operation and gives typical illustrations. Is intended to assist manufacturers of lime in correcting errors and establishing their industry on the most economical and efficient basis. 25 cents.

IC 6003. *The Gasoline Situation,* by H. H. Hill. 1926. 11 pp. States that the oil industry has been able to meet demands for gasoline in the past by developing new fields, by improving drilling and production practices, by recovering increasing amounts of gasoline from natural gas, and by more general use of the cracking process for manufacturing gasoline from heavier oils.

IC 6448. *Mining, Crushing, and Grinding Methods and Costs at the Reliance Cement-Rock Quarry of the Giant Portland Cement Co.,* by S. G. McAnally. 1931. 16 pp., 5 figs. Describes practices in use, more or less, throughout the Lehigh Valley cement district.

Courtesy of Pennsylvania Department of Forests and Waters.

Forest ranger's house, Huntingdon County.

VI

HUMAN RESOURCES

Health Paramount

PENNSYLVANIA'S most essential resource is a healthy group of citizens. Health is dependent upon such related factors as employment, food, clothing, shelter, education, and recreation.

"The Commonwealth has taken important steps in recent years in the conservation of human resources through health education, hospitalization, crime control, safety legislation, and social service. School children should be instructed in the rapid strides being made in the field of public health."[60]

Pennsylvania has an area of 45,302.33 square miles and a population of 9,631,350 (1930 census), more than one-third of this number living within the thirteen large city districts of Philadelphia, Pittsburgh, Scranton, Harrisburg, Wilkes-Barre, Allentown, Bethlehem, Easton, Erie, Reading, Lancaster, Altoona, and Johnstown. While these larger cities and their suburbs have grown, some of the northern and central counties of the State have been losing population steadily for thirty years. Densely populated districts accentuate the problem of health conservation.

PROTECTIVE AGENCIES

Each citizen, as a responsible member of society, must safeguard his own health. In order to assist the individual, governmental health agencies have been set up.

The Pennsylvania Department of Health has jurisdiction over water supplies, sewage disposal, restaurant hygiene, milk sanitation, and vaccination. It supervises 900 local boards of health and enforces quarantine laws in country districts. It is also responsible for periodic medical and dental examinations in the public schools. The dental hygienist examines the pupil, disorders are reported, and the child is referred to the family physician, dentist or a cooperating agency for treatment. An effort is also made to educate the pupil in general hygiene.[61]

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[60] *Pennsylvania, an Inventory.* p. 5.

The pneumonia program is a good example of health conservation by a governmental agency. This disease stands third on the list of death causes in the State in 1937. Pneumonia serum is known to be a powerful weapon in combating the disease, but this effective agency has been more or less a medical luxury until the Department of Health made this serum available free of charge. In 1936 an anti-meningococcic serum was added to the list of free biologicals and it is now given under the same regulations as diphtheria anti-toxin. These serums are distributed from various centers in the State, usually hospitals. As an example of health conservation during an emergency situation such as the flood of 1936, the Pennsylvania Department of Health was made responsible by the Governor for medical supplies, nursing care, and sanitation. The American Red Cross, in cooperation with the Department of Health, was in charge of food, clothing, and shelter of flood victims. It is worthy of note that not more than six cases of disease could be traced to the flood. During this emergency the Department of Health furnished typhoid vaccine to immunize 87,296 persons, 1,000 packages of tetanus gas gangrene anti-toxin, and 1,000 packages of plain tetanus anti-toxin. The total cost to the Department was $84,103.53, and included 950 tons of lime for sanitary clean-up and 115,000 pounds for disinfection of private water supplies.[62]

"The tuberculosis program has been particularly successful. In 1905 it was first in the list of death causes in Pennsylvania; in 1937, however, tuberculosis was sixth. The Division of Tuberculosis Clinics of the Pennsylvania Department of Health has a juvenile case-finding program conducted among High School and State Teacher's College Students. This program is carried out by eighty-eight State clinics and eleven admitting centers. The parent's consent must be obtained before any tests are given. Ordinarily the first step is a Mantoux Tuberculin Test which is followed by an

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[61] *Ibid.* p. 29.

[62] *New, Reestablished, and Reorganized Services of the Department of Health.* Jan. 15, 1935—March 1, 1938. p. 9.

Courtesy of Glen Lowry Studio, Stroudsburg, Pa.

Kitchens Creek Falls, Luzerne County.

X-Ray given by the traveling Roentgen-Ray Field Unit. Positive cases are referred to local clinics or physicians."[63]

As a part of modern technique in the treatment of tuberculosis, emphasis is being placed on chest surgery. The Department, on May 18, 1937, with Social Security funds opened its own temporary operating room at Hamburg Sanatorium. This room is equipped with the latest scientific improvements and will be used pending the completion of the surgical unit. The unit for which ground was broken April 27, 1937, accommodates thirty-seven patients during the period of operation and convalescence. It is equipped with two modern operating rooms, an X-Ray department, administrative offices, and staff rooms. This unit makes it possible to give to tubercular patients the advantages known to modern medicine and surgery.

The State's three sanatoria have a capacity of 2400 beds, but there is usually a waiting list of 700 to 1000 patients. In order to take care of this overflow it is planned to increase the capacity by 1300 or 1400 beds. This will absorb the waiting list and care for the patients discovered by the case-finding unit.[64]

"The building program under Social Security includes a new sanatorium in Western Pennsylvania for 500 adults, a wing for fifty children, administrative offices, staff rooms, and a dormitory for 100 patient and 100 non-patient employes."[65]

"Hamburg will have four new units which will increase the capacity by 200 beds. Ground was broken November 22, 1937, for these units."[66]

Mont Alto will have a new hospital with a capacity of 325 beds for children who have childhood type tuberculosis, an infirmary for 500 adults, a wing for seventy-five children suffering from adult type tuberculosis, a new kitchen and dining room, new nurses' home, quarters for seventy-five non-patient male employes, and a dormitory for 100 female non-patient employes. Careful studies of modern tuberculosis institutions were made so that advantage could be taken of new developments in hospital design.[67]

"Plans are under way for a State-wide survey to determine the number of diabetic patients in Pennsylvania. This program will include an educational campaign, diet and laboratory facilities, diagnosis, and insulin for indigent patients."[68]

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[63] *Ibid.* p. 19.
[64] *Ibid.* p. 23.
[65] *Ibid.* p. 23.
[66] *Ibid.* p. 23.
[67] *Ibid.* p. 23.

Cancer in 1937 was second in percentage of mortality in Pennsylvania. As a means of providing early diagnosis the State plans to establish seven cancer clinics to help eradicate this disease.[69]

In recent years an extensive program has been laid out for the control of venereal disease. With State funds and money received under the Social Security Act, two doctors and seventeen medical investigators have been added to the staff. Sixty additional clinics have been opened throughout the State where laboratory service is provided for the examination of patients. The Department of Health conducted a State-wide "Wassermann Week" from January 3, 1938 to January 8, 1938. During this period every citizen in the State was given the opportunity to have a free Wassermann test.

Containers and mailing tubes were furnished by the Department to private physicians and clinics throughout the State. As a result of this intensive campaign 31,872 Wassermann tests were performed, 3,772 of this number being positive. This program will be repeated this year and it is intended to make the "Wassermann Week" an annual event. The campaign is concentrated on the early stages of syphilis, for at this stage of infection hope of cure is greatest if proper treatment is carried out. During this time, with treatment, the spread of the disease is prevented as the patient cannot infect others. Drugs for treatment of syphilis are available to every physician and clinic in the State.[70]

Another very important program in the Department of Health is that for crippled children. Diagnostic clinics have been held throughout the State by eleven outstanding orthopedic surgeons. Four thousand six hundred and ninety-five children have been examined at these clinics. Children from this group needing short hospitalization are treated in local hospitals, but chronic cases are referred to the State Hospital for Crippled Children at Elizabethtown. When surgical treatment is not necessary orthopedic appliances are provided as prescribed by the surgeon. Under this plan the State pays the hospital $4.00 per day for treatment. This includes all services incidental to the hospitalization of the child at

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[68] *New, Reestablished, and Reorganized Services of the Department of Health.* Jan. 15, 1935—March 1, 1938. p. 17.

[69] *Ibid.* p. 17.

[70] *Ibid.* p. 22.

Courtesy of Pennsylvania Department of Health.

Children at Mt. Alto Sanatorium, Franklin County.

Elizabethtown. This hospital has a bed capacity of 130 patients and an out-patient clinic service. Under the building plan there will be added sixty beds, a physiotherapy department (which will include a large fresh water pool, a salt water pool, a Hubbard tank, and two whirlpool tanks), occupational rooms, heliotherapy rooms, and a new addition to the nurses' home. Ground was broken for the addition on December 15, 1937. The completed hospital will be able to care for children on the waiting list and the treatment of polio (infantile paralysis) cases from Mont Alto Sanatorium.[71]

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[71] *Ibid.* p. 21.

A medical program was approved by the State Board of Public Assistance, August 18, 1938. This program will provide the necessary non-institutional medical attention for public assistance cases. These cases will be able to make their own choice of physicians. The program allows for office and home calls, prescriptions, travel allowance for over five miles in rural sections, X-Ray pictures for fractures or suspected fractures, and $25.00 for obstetric cases with pre-and-post-natal care. The physician is to be the judge as to whether the case is a needy one.

Other protective agencies include local departments of health, district federations of private social service agencies, and particularly such groups as the American Red Cross, American Medical Society, and the Visiting Nurse Association.

ADVANCES IN HEALTH CONSERVATION

Many important advances have been made in health and physical education. In the past decade the teaching personnel in health education in Pennsylvania has increased from 150 to 2000. The student enrolment in the State colleges in health and physical education professional courses has passed 1200. The inclusion of showers, locker rooms, and gymnasiums in practically all secondary school buildings, in conjunction with intramural programs of major and minor sports aid in the promotion of health education.

The publication of practical bulletins containing courses in health instruction and physical education are a part of the educational services of the Department of Public Instruction.

SECURITY

Citizens can only be happy and useful members of society if they have employment at a living wage. Pennsylvania, with Federal assistance, has established a system of social insurance which assures financial aid to persons who for some reason are unable to earn a living.

Under the Social Security Act, the Federal Government (through the Social Security Board) aids the State government in administering assistance to the citizens of Pennsylvania. This act among other things sets aside money to be paid into the several sections of public assistance.[72]

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[72] *Informational Circular No. 1.* Department of Public Assistance. p. 2.

The Bureau of Old-Age Insurance handled directly by the Social Security Board is similar to unemployment compensation in that employers and employes participate. Employer and employe each contribute one per cent of the employe's yearly wages. This rate of tax increases at the rate of one-half per cent every three years until three per cent is reached. The benefits realized at the age of sixty-five are based on the wages earned during a life-time. Pennsylvania, without Federal Social Security funds, could not hope to carry out such a wide program of social insurance.

The State public assistance or security program is divided into four divisions. These include general assistance, pensions for the blind, old age assistance, and aid to dependent children.

General Assistance, known as direct relief, is given unemployed or needy persons living in Pennsylvania one year or more and having no responsible relatives. The maximum allowance is $30.00 per month which is contributed entirely from State funds. For the month of August, 1938, the total expenditures for general assistance was $6,410,749.51, for the aid of 661,052 persons.

Pensions for the blind are also paid entirely by the State to the blind citizens over twenty-one who have lived in Pennsylvania five years or more and have less than $1200.00 annual income and not more than $5000.00 in property. This allowance is fixed by law at $30.00 a month. For the month of August, 1938, the amounts of grants for blind pensions totaled $353,173.11 for 11,803 citizens.

Old Age Assistance is relief for needy citizens over seventy years of age who have lived in Pennsylvania five years or more, who have no relatives to support them, and have not transferred property worth $500.00 or over within two years without a fair profit. The maximum financial aid is $30.00 per month. This assistance is paid from State and Federal funds on an equal basis. For the month of August, 1938, the amount of grants for the old age assistance was $1,892,534.26 for a total of 89,036 individuals.[73]

"Aid to dependent children, or Mothers' Assistance, is paid for children under sixteen living with their mothers, who have been deprived of a father's care and lack responsible relatives. Two-thirds of this allowance is paid by the State and one-third from Federal funds. The amount varies according to the size of the family. During the month of August, 1938, the total grants amounted to $602,733.38 for 60,925 children and mothers."[74]

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[73] *Ibid.* p. 1.

Workmen's Compensation, a State function, is paid by employers to persons becoming totally or partially disabled while at their work. The following schedule of compensation is established for injuries resulting in total disability: "For the first 500 weeks sixty-five per cent of the wages of the injured employe; but the compensation shall not be more than $18.00 per week nor less than $12.00 per week. Provided that, if total disability shall continue for a period of four weeks or more, the employe shall also be entitled to receive compensation for the first seven days of total disability. Should total disability become permanent, then, in addition to the compensation provided for 500 weeks, and beginning at the expiration of the 500 weeks, the sum of $30.00 per month shall be payable during such permanent total disability prior to death. Provided, however, that such monthly payments shall cease if the person receiving compensation accepts other public funds contributed to by the employer which equal or exceed the amount of compensation payments. Nothing in this clause shall require payment of compensation after disability shall cease."

Unemployment Compensation, like workmen's compensation, is handled by the Department of Labor and Industry in cooperation with the Social Security Board. This fund is contributed to by employers and employes and provides for a compensation to be paid to anyone who for any reason other than his or her own has been out of work for three weeks in succession. The rate and payment of weekly compensation is as follows: "Compensation shall be payable at a rate of fifty per cent of the employe's full-time weekly wage, but the amount shall not be more than $15.00, nor less than $7.50 per week. An employe's weekly compensation amounts, as determined for the first week of his benefit year, shall constitute his weekly compensation amount throughout such benefit year."

MENTAL INSTITUTIONS

"Pennsylvania has eight State-owned mental hospitals. They are: the Allentown State Hospital with a bed capacity of 1,494; Danville State Hospital, 1,947; Farview State Hospital, 708; Harrisburg

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[74] *Informational Circular No. 1.* Department of Public Assistance. p. 1.

State Hospital, 1,921; Norristown State Hospital, 3,407; Torrance State Hospital, 1,217; Warren State Hospital, 1,673; and Wernersville State Hospital, 1,466. In addition there are four State institutions for the feeble-minded and epileptics: Laurelton State Village, 665; Pennhurst State School, 1,746; Polk State School, 2,632; and Selinsgrove State Colony for Epileptics, 442. In addition there are several local and county mental institutions and a great number of private hospitals."[75]

"Mental illness, like physical illness, can often be cured by rest and treatment. It is not always necessary to place patients in institutions. Many can live at home on parole and gradually become more or less self-supporting. Some hospitals prefer to use the words "furlough" or "on visit" instead of "parole" as they feel it has a criminal connotation. These patients on parole may continue living at home for a year or more and if it is not necessary to return them to an institution they are automatically discharged to take their place in society. Some mental defectives, however, may continue on parole for years."[76]

For the year ending May 31, 1936, in the eight State Hospitals, there were 17,137 patients on the register at the beginning of the year, with 2,362 of them on parole; 485 recovered; 1,163 improved and 104 unimproved.

The program at present does not meet the demands of the State. The State Department of Welfare has presented a ten-year program through which they will make adequate provision for the care and treatment of the mentally ill, mentally defective, epileptic, and the delinquent citizens of the State. This program will include the use of the Pennsylvania Industrial School at Huntingdon as a State institution for defective delinquents. Vocational and agricultural training will be given to these delinquents in the shop and on the farm. The Laurelton State Village will be enlarged to accommodate all feeble-minded and defective delinquent women who are on the waiting list. This enlargement will help to accommodate 2,500 patients. Two psychiatric hospitals will be built, one at Philadelphia and the other at Pittsburgh to be used as centers of research in mental and nervous diseases. The Selinsgrove Colony of

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[75] *New, Reestablished, and Reorganized Services of the Department of Health.* Jan. 15, 1935-March 1, 1938. p. 9.

[76] *Eighth Biennial Report of Secretary of Welfare.* Bulletin 65.

Epileptics will be enlarged to accommodate 2,000 patients. The capacity of the Pennhurst State School for mental defectives will be increased to house 3,000 patients. The capacity of the State Industrial Home for Women is to be doubled.

DELINQUENCY CONTROL

In the conservation of human resources much can be said about character development among delinquents. Crime cannot be controlled as long as conditions exist to help breed criminals. Overcrowded, unsanitary homes are often the environment in which criminals are bred. To help correct this condition the State Housing Board is engaged in the preparation of a program for slum clearance in several of the larger cities.

The Pennsylvania Department of Welfare has a ten-year program for the improvement and enlargement of the State-owned penal and correctional institutions. These institutions are the Eastern State Penitentiary at Philadelphia with a capacity of 944; New Eastern State Penitentiary at Graterford, 2,000; Western State Penitentiary at Pittsburgh, 1,182; New Western State Penitentiary at Rockview, 750; Pennsylvania Industrial School at Huntingdon, 998; Pennsylvania Training School at Morganza, 625; and the State Industrial Home for Women at Muncy, 243. Approximately 3,000 men and women are released or paroled annually from these institutions. The rehabilitation program includes the abandonment of the Eastern and Western Penitentiaries and the establishment of one security prison near the central part of the State. The present institutions are to be used as diagnostic depots for the reception and detention of prisoners until they can be classified by a board of the Department of Welfare.

Since 1936, nearly 900 prisoners have returned to society better fitted for a place in their community as a result of their vocational training. It is planned to extend this education system, with a view toward giving each person correct treatment and care. Each institution also has a building program for the enlargement of quarters, and more extensive recreational and vocational facilities.

Under construction at present is the Cumberland Valley State Institution for defective delinquents. When completed, it will be used to house and train male delinquents. The Pennsylvania Industrial School at Huntingdon is one of the largest and most beneficial projects on the program. This institution will be changed from a reformatory to a modern industrial school with every facility to encourage the delinquent to overcome his shortcomings by teaching him a trade.

The prison farm is another step forward in this program. Pleasant outdoor work helps build up the bodies of the inmates and at the same time provides these institutions with most of their own food.

This system of rehabilitation, trade training, and prison labor is becoming recognized as one of the best in the country, and authorities often visit Pennsylvania's prisons to get ideas for use in other States.

Guidance for Teachers on Human Relations

1. List and describe briefly Pennsylvania's social and economic experiments; for example, The Harmony Society, The Old Moravian Economy.
2. Discuss the part health and physical education plays in the conservation of human resources.
3. Review pamphlets issued by the various State departments pertaining to government, crime control, safety and health legislation, and child labor regulations.
4. Discuss first aid and life-saving methods with pupils and give demonstrations.
5. Develop a health education program that gives emphasis to healthy living rather than to curative and remedial practices.
6. Discuss foods and nutrition, care of the body and mind, control of diseases and their prevention, sanitation, fire prevention, human education.
7. Relate what work is being done by the local and State health agencies and private organizations.
8. Emphasize the effect accidents, unemployment, and illness have on happiness and security.
9. List the various safety organizations in the State and describe their work.
10. Show slides or films demonstrating the vital need for avoiding contact with disease.

11. Read to class excerpts from books that deal with social problems.
12. Ask highway officials to address pupils on safety measures.
13. Encourage children to report dangerous conditions they observe on their way to and from school.

Film Strips and Slides

The Pennsylvania Department of Health, Bureau of Public Health Education, has made available to every school in the State the following group of films and lantern slides. If necessary a projector and operator will be furnished. These films and services are free of charge.

COMMUNICABLE DISEASE PROTECTION:		
Conquering Diphtheria	One reel	35mm
Preventing Diphtheria	One reel	35mm
One Scar or Many (Smallpox)	One reel	35mm
FLY AND MOSQUITO EXTERMINATION:		
Fly Danger	One reel	16mm
The Mosquito	One reel	16mm
TEETH:		
Clara Cleans Her Teeth	One reel	35mm
Don't Wait Until It Hurts	One reel	35mm
Your Mouth	One reel	35mm
Tommy Tucker's Tooth	One reel	16mm
ANIMATED CARTOONS:		
Diphtheria		
Milk		
Fly	One-half reel	35mm
CHILD WELFARE:		
Bending the Twig	One reel	35mm
Our Children (Health Centers)	Two reels	35mm
Sun Babies	One reel	35mm
Well-Born	Two reels	35mm
The Long vs. The Short Haul, or Mother's Milk Best for Baby	One-half reel	35mm
TUBERCULOSIS:		
The Jinks (a humorous animated picture on Tuberculosis)	One reel	35mm
Your Wards at Cresson	One reel	35mm
VENEREAL DISEASES:		
Men's Lecture	Three reels	35mm
Modern Diagnosis and Treatment of Syphilis	Three reels	35mm

Science of Life	No. 10 Girls No. 11 Men No. 15 Mixed Audience (One reel each)	35mm
Social Hygiene for Women	Two reels	35mm
MISCELLANEOUS:		
How to Live Long and Well	One reel	35mm
How to Live Long and Well	One reel	16mm
Posture	Two reels	35mm
Public Health Twins at Work	One reel	35mm
Your Glass of Water	Two reels	35mm
Milk—The Master Builder	One reel	16mm
Preventing the Spread of Disease	One reel	16mm
Confessions of a Cold	One reel	16mm
Forming the Habits of Health	One reel	16mm
Your Glass of Water	Two reels	16mm
Sunshine Lady	One reel	16mm
Care of the Teeth	One reel	16mm
Tuberculosis and How It May Be Avoided	One reel	16mm
Syphilis; Its Nature, Prevention and Treatment	Two reels	16mm
The House Fly	One reel	16mm

LANTERN SLIDES

Keeping Fit (Boys)
Youth and Life (Girls)
The House Fly

Bibliography Available to the Classroom

The following publications are issued free of charge, by the Pennsylvania State Department of Health. They can be obtained through the Bureau of Health Education.

GENERAL:

- New, Reestablished and Reorganized Services of the Department of Health, January 15, 1935-March 1, 1938.
- Pennsylvania's Health.
- Biennial Report, 1928-1930.
- Yearbook, 1929-1930-1931.

DISEASES:

- Anterior Poliomyelitis (Infantile Paralysis).
- Tuberculosis.
- Chickenpox.
- Smallpox.
- Mumps.
- Whooping Cough.
- Measles.
- Cerebrospinal Meningitis.
- Scarlet Fever.

Diphtheria.
Diphtheria Control.
Typhoid Fever.
Pneumonia (Supplementary Bulletin No. 1).
Pneumonia Control.

Maternal and Child Health:

Blindness in Infants.
A Manual for Expectant Mothers.
Prenatal Care—No. 4.
Prenatal Care (Supplementary Bulletin No. 3).
Diet During Pregnancy.
The Care of the Mother.
Pennsylvania Baby Book.
Infant Care—No. 8.
The Care of the Baby.
Breast Feeding.
Bottle Feeding.
Diet for Child From Two to Three Years.
Diet for Child From Four to Six Years.
Diet for Child From Eighteen to Twenty-four Months of Age.
The Child From One to Six—No. 30.
Child Management—No. 143.
The Sleep of the Preschool Child.
Summer Diarrhea.

The Social Diseases:

A Catechism on Syphilis.
Healthy, Happy Womanhood.
Keeping Fit.
Manpower.
Sex Education in the Home.
The Wonderful Story of Life for Girls.
The Wonderful Story of Life for Boys.
Distributed in limited quantities.
Syphilis (Supplementary Bulletin No. 2).
The Nurse as a Factor in Venereal Disease Control.
Congenital Syphilis.
Syphilis—Its Cause—Its Spread—Its Cure.

School Medical Inspection:

Dental Hygiene—Form No. 1056.
Manual for School Health Service—Third and Fourth-Class School Districts.
Weight, Height, Age Table for Boys and Girls (Chart, Form 50-W).
Sanitary Cleaning of Schoolrooms.
Public Health Laws and Advisory Health Board Regulations With Interpretation of Use or Forms.

Narcotic Drug Control:

Pennsylvania Anti-Narcotic Act, with Amendments.
Marihuana.

INDUSTRIAL HYGIENE:

Control of Occupational Diseases in Pennsylvania.

VITAL STATISTICS:

Birth Registrations.
Why Register?
Vital Statistics Bulletin.

RURAL SANITATION:

Model Ordinance Sanitation of Tenement, Lodging and Boarding Houses, Boroughs or Townships of the First Class.
Model Nuisance Ordinance.
Model Smoke Ordinance.
Model Garbage Ordinance.
Safe Water Supplies and Waste Disposal for Rural Residents.
Septic Tanks.
Common Sense Sanitation.
Direction for Constructing Cesspools.

STATE LAWS AND REGULATIONS OF ADVISORY HEALTH BOARD:

Laws of Pennsylvania Relating to Public Health.
The Vaccination Law.
Quarantine Laws.
Rules and Regulations of the Department of Health.
Milk Law.
Rules and Regulations as to Sanitation in Tenement, Lodging and Boarding Houses.
Rules and Regulations as to Public Health Nuisances.
Rules and Regulations for Control of Sanitation in Camps Used by the Public.
Rules and Regulations for Control of Sanitation in the Shellfish Industry.
Rules and Regulations for Bathing Places, Swimming Pools and Natatoriums.
Rules and Regulations of the Department of Health and Advisory Health Board To Be Observed by Undertakers, Sextons, etc.
State Plumbing Code, Act 44—Approved March 31, 1937.
Stream Pollution, Act 394—Approved June 22, 1937.

(The above pamphlets, except where otherwise noted, may be obtained upon request to the Secretary of Health, State Department of Health, Harrisburg, Pennsylvania.)

VII

SCENIC AND HISTORICAL RESOURCES

EQUALLY important to Pennsylvania are its places of historic interest and the conservation of its natural scenic beauty. To achieve the fullest appreciation of these things, they should be made more easily available to the public. Realizing this, the Federal and State governments have set aside public parks and forest areas, and have erected monuments at the various historic points of interest.

Twenty-eight thousand miles of good roads and safely patrolled highways, as well as conveniently situated hotels, tourist camps, cabins and resorts, facilitate the enjoyment of the scenic beauty of Pennsylvania's mountains, rivers, and valleys, and visits to its points of interest.

HISTORIC SITES

Gettysburg (Adams County)

One thousand monuments and statues mark the twenty-five miles of Pennsylvania's outstanding battlefield, Gettysburg, which was dedicated by President Abraham Lincoln in his immortal address on November 19, 1863. There are over thirty miles of paved roads in the 2,530 acres of the reservation. In this bloody, three-day battle, 80,000 men of the Army of the Potomac met the Confederate Army of Northern Virginia, of 73,000 men. Of the 3,500 men who fell and are buried here, more than 1,000 are listed as unknown.

Valley Forge (Montgomery County)

Reproductions of the log cabins and fortifications that marked the scene of Washington's stay at Valley Forge, during the winter of the British occupation of Philadelphia, have been erected as a memorial to the sturdy continentals and their leader. The Washington Memorial Chapel contains many relics of the Revolutionary War and its stained glass windows depict various phases of American history. Thirteen bells in the National Peace Chimes symbolize the original colonies.

Old Economy (Beaver County)

Pennsylvania honors, not only the acts of war, but also, the achievements of peace. The preservation of Old Economy, now in the town of Ambridge, Beaver County, is an example of this. It was the seat of a cooperative society known as the Harmony Society. Originally organized in Wurttemberg, Germany, by John George Rapp, the Society was established first at Harmony, Pennsylvania, and in 1825 was moved to Economy. Old furniture and household treasures are preserved in several of the original buildings, the Great House, home of "Father Rapp," the Music Hall, the Old Wine Cellar, and the Carpenter Shop, which are all State property.

Ephrata Cloisters (Lancaster County)

The Ephrata Cloisters, now in the care of the Historical Commission of Pennsylvania, were built in 1733 by a religious group, the Seventh Day Baptists, who founded a colony there in 1728. Much of the early development of the arts came from these people. The first hymn book in America was written at the Ephrata Cloisters.

Cornwall (Lebanon County)

One of the richest iron mines in the world is located at Cornwall, founded in 1742 and named for the town of Cornwall, England. The Cornwall Furnace, which was founded in 1735, and operated until 1883, supplied large quantities of iron for Revolutionary War cannon. Mrs. Margaret C. Buckingham presented the Furnace to the State, together with a trust fund for its maintenance. The iron ore mines are owned by the Bethlehem Steel Company.

Erie (Erie County)

The excellent harbor of Pennsylvania's only lake port is protected by Presque Isle, a peninsula six miles long and one mile

Courtesy of Glen Lowry Studio, Stroudsburg, Pa.

Lake Wallenpaupack, Wayne-Pike Counties.

wide. In 1753, a French military unit built Fort de la Presque Isle. on the site of Erie. It was also occupied at various times by the English. In 1796, General Anthony Wayne, then commander of the fort, died and requested burial at the foot of the flagstaff. In 1809, the remains were moved to Radnor, Pa. The blockhouse was reproduced on the site as a memorial to him. The Erie Custom House, which was erected in 1839, is one of the oldest Federal buildings, and is still standing.

From this famous harbor Commodore Oliver Hazard Perry's fleet sailed to meet and defeat the British fleet, on September 10, 1813. The "Niagara," Perry's flagship, lay on the bottom of Misery Bay for many years. Although it was taken up and an attempt made to rebuild it for the 1913 Centennial, it was never finished because of lack of money. The hull can be seen on Presque Isle Peninsula.

Philadelphia (Philadelphia County)

The "Quaker City," which occupies all of Philadelphia County, is the largest city in Pennsylvania and the third largest in the United States. It was settled in 1681 by Captain William Markham, an envoy of William Penn who followed a year later. In more than two centuries and a half of growth, Philadelphia has seen much of the making of American history and has preserved many of the buildings that took part in the birth of our country. Located at Sixth and Chestnut Streets is Independence Hall, where the Declaration of Independence was signed, and where the Liberty Bell is housed. Adjacent to this building is Congress Hall, famous as the home of the First Congress of the United States. Carpenter's Hall, between Third and Fourth Streets on Chestnut, was the meeting place of the First Continental Congress.

The oldest bank building in America stands at 116 South Third Street. It was built in 1795 and was the home of the first United States Bank.

The famous Chew House, which was built in 1760, was in the center of the fray during the battle of Germantown and is still preserved in Germantown. During the battle the British soldiers under Colonel Musgrove took refuge here, and cannon ball and bullet marks can be seen. The Betsy Ross House, at 239 Arch Street, is also preserved as a Revolutionary point of interest.

Many of the old Colonial homes have been restored and furnished in the original style. These are open to the public at a small admission charge.

Two important, old, historic churches in Philadelphia are the Old Swedes' Church, at Swanson Street below Christian, which was built in 1700 and is the oldest church in the city, and Christ Church, between Market and Arch Streets, on Second, which was the place of worship for many of the Revolutionary heroes.

William Penn established the first public school in America in 1689. Today, the old Penn Charter School at School Lane and Fox Street, in Germantown, is one of America's finest private preparatory schools.

The Pennsylvania Historical Society, at 1300 Locust Street, has one of the finest old manuscript collections in the country. In

1731, Benjamin Franklin founded the Library Company, at Locust and Juniper Streets. It is the oldest subscription library in the country and contains 175,000 volumes.

Harrisburg (Dauphin County)

Harrisburg was erected in 1785 and since that time has been the county seat of Dauphin County. Prior to that date it had been known as Harris' Ferry, after John Harris, Jr., who was granted ferry rights on the Susquehanna in 1753, and whose father was the first settler in the vicinity, in the early part of the eighteenth century. It has been the capital of Pennsylvania since 1812 and has some of the most beautiful state buildings in the country.

John Harris, Sr., is buried in the beautiful River Park which extends for five miles along the east bank of the Susquehanna River. A high iron fence encloses the grave. Opposite the park, at 216 South Front Street, is his home, which was built in 1776. This graystone building is now (1939) the state office of the National Youth Administration.

Paxtang (Dauphin County)

The oldest Presbyterian Church in Pennsylvania that has been in continuous use is the Paxton Church, at Paxtang. This was the scene of many bitter Indian fights and the building was burned by them on various occasions. John Harris, Jr., is buried in the cemetery.

HISTORIC PARKS

There are at the present time ten historic parks in Pennsylvania under the administration of the Department of Forests and Waters.

Washington Crossing Park (Bucks County)

Washington Crossing Park is a Revolutionary memorial marking the spot where the Continental Army crossed the Delaware on Christmas night, 1776. It is located on State 32. The countryside is rich in historic landmarks at this point, such as the McConkey Ferry Inn, and the Richardson house, the latter being the place where Lafayette's wounds were treated after the Battle of Brandywine.

Valley Forge State Park (Montgomery and Chester Counties)

As previously noted, Valley Forge is an important Revolutionary War shrine, and is the site of Washington's sojourn during the winter of 1777-78. It is on State 23.

James Buchanan's Birthplace (Franklin County)

James Buchanan was the only Pennsylvanian who attained the honor of being a United States President. The park is located on State 16, and is the site of this eminent man's birthplace.

Bushy Run Battle Park (Westmoreland County)

The battle of Bushy Run, in August 1763, was a decisive defeat of the Indians by Colonel Bouquet's forces, who were on their way to Fort Pitt with supplies. The park is a short distance from State 993, and the Commonwealth owns about fifty acres of the land, including the site of the famous "Flourbag Fort."

Conrad Weiser Memorial Park (Berks County)

Located on U. S. 422, is the beautiful twenty-five acre shrine to the famous Indian peacemaker and interpreter. Now 200 years old, the original old Weiser mansion has been restored and houses a museum of rare records and relics.

Drake Well Park (Venango County)

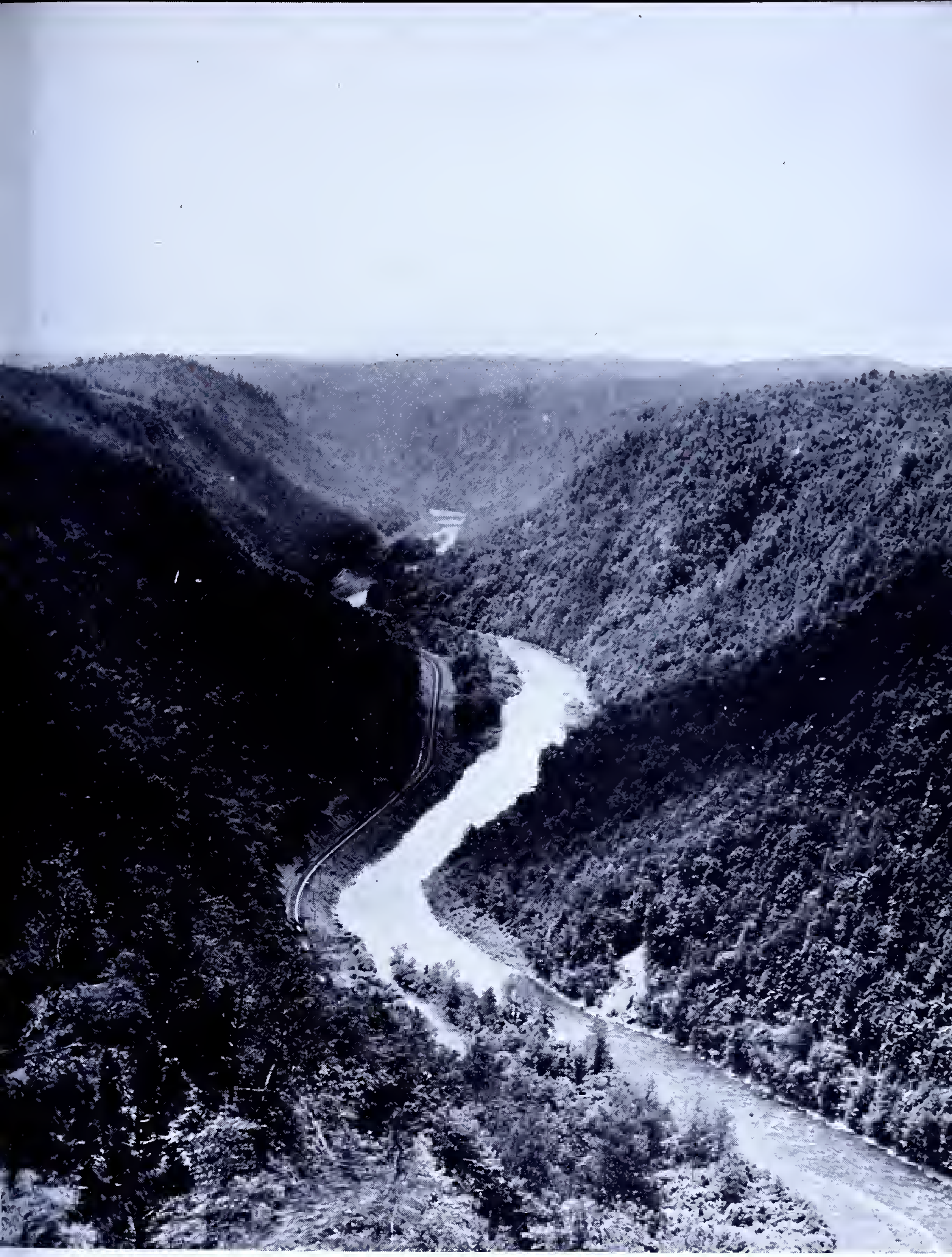
Drake Well Park marks the site of the world's first successful oil well (1859), and is located on State 8. It was presented to the State by the American Petroleum Institute.

Fort Necessity Park (Fayette County)

Fort Necessity Park is the site of the Great Meadows Battle of July 3, 1754, during which Washington and his small band of Virginians were finally overcome by the French and Indian forces. The park is located on U. S. 40.

Fort Washington Park (Montgomery County)

Fort Washington Park includes Militia Hill and Fort Hill, continental army fortifications. It is on U. S. 309, and is an extension of Fairmount Park.



urtesy of Pennsylvania Department of Highways.

Pine Tree Gorge, Tioga County.

F. W. Ritter, Staff Artist.

Shikellamy's Profile, Northumberland County.

Presque Isle Park (Erie County)

Presque Isle Park is located on U. S. 19. It was an important point in the development of western Pennsylvania and the Great Lakes region. On June 4, 1763, Presque Isle was the scene of an attack by Pontiac. Included in its 4,370 acres are many miles of bathing beach.

CAVERNS

Pennsylvania has within its boundaries about 100 caves, fourteen of which are open to the public. One cave has been open to paying visitors since 1873, another since 1885, and a number of others since 1928.

"Pennsylvania's caves vary from 250 to 2,000 feet in length. Ceilings also vary, the highest being eighty-nine feet. Openings vary from mere passages wide enough for one person to chambers 100 feet wide.

"*Hipple Cave* at Waterside, is twelve miles north of Everett and twenty-two miles south of Altoona. The cave is fifty feet high and is 1,200 feet long. It was discovered by a pioneer named Hipple who tracked a bear to its entrance.

"*Wonderland Caverns* are located under two quarries, about 500 feet east of the Main Street of Manns Choice on State 31, two and one-half miles south of the Lincoln Highway (U. S. 30). These caverns are open to visitors from May 30 until October 31.

"*Onyx Cave* is in the northern end of Berks County, seventeen miles north of Reading and four miles from Shoemakersville. It can be reached by U. S. 122 which crosses 22 at Hamburg. The cave is about fifty feet high and 220 yards in length. It was discovered in 1872 by blasting a limestone quarry, but was not opened to the public until 1923. Onyx cave received its name from the calcium carbonate formations, striped in white, brown, and red.

"*Penn's Cave* in Brush Valley is four and one-half miles from Centre Hall, and can be reached over State 53 from Bellefonte, or over Seven Mountains from Lewistown. This is the only cave in Pennsylvania entirely traversed by boat. It is 55 feet high and the water is thirty-five feet deep. The trip through the cave takes thirty-five minutes. It was named in 1764 in honor of the grandson of William Penn.

"*Crystal Cave* is located on U. S. 22, five miles west of Kutztown. This cave, the oldest one in service in Pennsylvania, has been open to visitors since 1873; it is situated in the center of a farming district. It was discovered by William Merkel in 1871, while quarrying for limestone, and received its name from the sparkling white calcite crystals that line the walls.

"*Veiled Lady Cave* is about half way between Penn's Cave and Madisonburg, on State 95. There is a story of a hidden lake in this cave but it has never been found. It was named for the figure of a woman seated on a rock supposedly waiting for her Indian lover, who was washed into the lake while trying to reach her.

"*Woodward Cave* is located on State 45, about twenty-five miles from Lewisburg, and twenty miles from Centre Hall. The cave includes one irregular room, about 100 by 200 feet, with a pillar in the center, and various passages leading from the chamber. It contains a small crystal lake, and is unlike other caves in Pennsylvania in that the bedding and walls are limestone, and well rounded as if freshly scoured by running water.

"*Indian Echo Cave* is located in the bank of the Swatara Creek at Hummelstown, just off U. S. 22, ten miles east of Harrisburg. The cave is over 400 feet long. Over 100 years ago, a hermit, Amos Wilson, lived in this cave for nineteen years.

"*Baker Caverns* are located on State 16, one mile south of Williamson, two miles north of Upton, and six miles south of St. Thomas. The latter is on the William Penn Highway.

"*Historic Indian Cave* is on State 45, at Franklinville, about thirteen miles east of Tyrone. The developed part of the cave is approximately 1,700 feet in length. A local legend says that Robber Lewis, the Robin Hood of Pennsylvania, buried his treasure in the cave."[77]

"*Lincoln (formerly William Penn) Caverns* are located about three and a half miles west of Huntingdon. They were found in 1930, during the grading of the William Penn Highway.

"*Alexander Caverns* are about nine miles north of Lewistown, and three and a half miles from Reedsville, on State 972. One of the caves is perfectly dry, but the other has a stream running through it.

"*Seawra Cave,* which was opened to the public in 1928, is located eleven miles northeast of Lewistown, at a shady picnic grove. The name is a combination of the names of the leaser and owner, Searer and Wray. It is said that small boys discovered this cave while hunting the buried treasure of a Civil War veteran. Like Alexander caverns, this cave is protected from souvenir hunters, and remains intact, except at a few places where foot paths were constructed.

"*Lost Cave* lies south of Bethlehem about one-half mile, and east of Hellertown, on State 412. It was discovered in 1883 and opened to the public in May 1930. The cave is seventy feet high and about sixty feet at its widest point. The length is 400 feet. The Lake

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[77] *Pennsylvania Has Everything.* pp. 18-20.

Room is covered with four feet of water by an underground stream."[78]

STATE MUSEUM

Pennsylvania's State Museum is constantly adding to its collection of objects which trace Pennsylvania history from the time of the aborigines to the present day. The exhibits are arranged according to the periods they depict. Rotherwell's famous painting, "The Battle of Gettysburg," occupies the entire eastern wall of the main room of the museum. Proctor's painting, "The Rattlesnake Flag," is one of the priceless, historical relics of the museum.

About 10,000 people visit the museum monthly. Thousands of school children and adults are instructed and entertained through the medium of slides, films, and cabinet exhibits that are sent regularly to all parts of the State. An average of 25,000 slides, portraying a variety of Pennsylvania subjects, such as art, biography, civics, geography, health, history, literature, mathematics, music, and science are lent monthly to public schools, colleges, and other organizations.

To establish a closer relationship between the museum, schools, and citizens of the Commonwealth, regular meetings dealing with archaeology, history, and education are held both at the museum and throughout the State.

THE CITIZEN'S RESPONSIBILITY

Every citizen of Pennsylvania has a vital part in the conservation of points of scenic interest and of historic association. The manner in which a landowner keeps his home, farm, or factory adds or detracts from the beauty of the landscape.

Each citizen should feel a personal responsibility when he visits a park or grove or hunts in a forest. He should place trash and papers in receptacles provided at camps and picnic groves, and he should abide by regulations for the prevention of forest fires.

Guides for Classroom Study of Scenic and Historic Resources

1. Prepare a list of places of scenic beauty in Pennsylvania.
2. Review and, if possible, visit nearby historical points.
3. Outline a history of Pennsylvania highways and canals.

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[78] *Pennsylvania Has Everything.* pp. 18-20.

4. Locate old turnpikes, toll roads, and old bridges in the local community. Tie up these roads and bridges with events of historical significance.
5. Name the caverns in Pennsylvania and describe the wonder of caverns.
6. Discuss antiquities—Indian mounds, cemeteries, village sites, covered bridges.
7. Tell the story of historic buildings—Independence Hall, churches, the first log cabins.
8. Discuss the countryside in general—mountains, valleys, plains, lakes, rivers, waterfalls, marshes, vegetation, trees, flowers, and shrubs.
9. Obtain detailed information on the State Museum at Harrisburg for classroom use. Prepare report on its wealth of historic objects and the significance of the collections.
10. Prepare papers which have as their basis some particular phase of Pennsylvania's history.
11. Prepare a brief historical sketch describing the early settlement of the local community.

Slides Available to the Classroom

The following list of slides are available, free of charge, from the State Museum through its Visual Education Section. The borrower is responsible for transportation charges.

	No. of Slides
American History, General	50
The American Indians	66
The Revolutionary War	30
Causes and Events	16
First Continental Congress	19
Second Continental Congress	18
The Conflict	31
Declaration of Independence	25
Civil War	76
Founding of Pennsylvania	30
Pennsylvania	92
Harrisburg	69
Flag Day	54
Franklin's Birthday	66
Independence Day	29
Lincoln's Birthday	67
Gettysburg Battlefield	40
Penn Day	44
Pennsylvania, General	6
Pennsylvania, Scenic	64
Pennsylvania (By Counties)	
Adams	54
Gettysburg National Park	40
Allegheny	31
Bedford	12
Berks	7

Blair 9
Bradford 1
Bucks 7
Cambria 6
Cameron 4
Carbon 6
Centre 6
Chester 8
Cinton 2
Columbia 1
Cumberland 31
Dauphin 43
  State Capitol 46
Delaware 10
Erie 10
Franklin 21
Huntingdon 19
Indiana 3
Juniata 9
Lackawanna 11
Lancaster 36
Lehigh 9
Luzerne 6
Lycoming 6
Mercer 3
Mifflin 1
Monroe 16
Montgomery 23
Montour 3
Northampton 11
Northumberland 6
Perry 7
Philadelphia 57
  Delaware River Bridge, Building of, ... 50
Pike 8
Potter 10
Schuylkill 2
Snyder 1
Somerset 1
Sullivan 17
Venango 2
Warren 5
Westmoreland 2
York 1

APPENDIX A

ORGANIZATIONS AND AGENCIES COOPERATING IN CONSERVATION

Four general groups may be listed as cooperative organizations and agencies in the field of conservation education. They include educational institutions, youth organizations, voluntary adult organizations, and Government agencies.

EDUCATIONAL INSTITUTIONS

Under the heading of educational institutions would be the following: public schools, teachers' colleges, schools of education, agricultural colleges, forestry schools, schools of mining, and technical institutes.

YOUTH ORGANIZATIONS

Among the youth organizations are the Future Farmers of America, Future Craftsmen of America, Boy Scouts of America, Girl Scouts of America, Camp Fire Girls, Y. M. C. A., Y. W. C. A., Youth Centers, School Clubs, Junior Chambers of Commerce, and the 4-H Clubs.

VOLUNTARY ADULT ORGANIZATIONS

Cooperating voluntary adult organizations are the Educational Conservation Society, National Recreation Association, Wild Flowers Preservation Society, American Wildlife Institute, American Tree Association, American Forestry Association, American Nature Association, Garden Club of America, Isaak Walton League of America, and the National Association of Audubon Societies.

NATIONAL AGENCIES

Federal Government agencies active in conservation work include the Forest Service, Resettlement Administration, National Park Service, Soil Conservation Service, National Resources Committee, Federal Power Commission, Tennessee Valley Authority, and, more broadly, the Federal Departments of Agriculture, Commerce, Interior, Labor, and War.

STATE DEPARTMENTS

State agencies for conservation include the Pennsylvania Historical Commission, Pennsylvania Publicity Commission, Pennsylvania State Conservation Council, and the Departments of Agriculture, Forests and Waters, Health, Welfare, Insurance, Internal Affairs, Public Instruction, and the Board of Game Commissioners.

The Pennsylvania Department of Agriculture advises on cultivation of plants, consults on plant diseases and pests, provides speakers, and publishes bulletins of information.

The Department of Forests and Waters operates nurseries, maintains district offices, provides trees, provides district foresters, and publishes useful circulars.

The Department of Internal Affairs develops plans for school grounds, plans playgrounds and athletic fields, plants trees and shrubs, and publishes information.

The Department of Public Instruction supervises the State program of public education; publishes Arbor and Bird Day bulletins and other documents dealing with conservation; provides consultants in the field; and preserves landmarks through the Historical Commission.

The Board of Game Commissioners consults on wild birds and their preservation, provides speakers, and publishes bulletins on birds and their protection.

LOCAL GROUPS

Local conservation agencies include the city or town council, park commission, board of health, school board, street and road commissioners and school and home visitors.

APPENDIX B

April 14, 1939—Southern Pennsylvania
April 28, 1939—Northern Pennsylvania

WHEREAS, The conservation of those natural resources which provide for our daily needs, by replenishing the water supply, enriching the soil, yielding food, and furnishing scenic beauty and satisfaction, has become a serious problem in our national life; and

WHEREAS, A State with few trees would eliminate our countless birds, which serve the common welfare by their continuing warfare against crop enemies and pests, in addition to enriching our lives by their cheerful presence in forest, field and park; and

WHEREAS, Our natural resources in the form of primeval forests, refreshing streams and exciting wildlife are assets which not only give wholesome pleasure, but which are fundamentals in the economic program of conservation—life-giving assets vital to the continued welfare of the State, our health, comfort and prosperity as individuals; and

WHEREAS, The recreation areas on our 1,650,937 acres of State-owned forest lands afford an opportunity to all our people to engage in wholesome outdoor pastimes, thereby renewing their strength and heartening their spirit, making them better able to cope with the burdens of the day; and

WHEREAS, Conservation constitutes a challenge to every citizen to appreciate in these crucial times the many blessings that nature has showered upon us, and the grave responsibility of every citizen to propagate forests, conserve wildlife and make Pennsylvania a more beautiful and bountiful State in which to live; and

NOW, THEREFORE, I, Arthur H. James, Governor of the Commonwealth of Pennsylvania, do hereby proclaim Friday, April 14th and 28th as Spring Arbor and Bird Days—the earlier date to be observed in the southern part of the State and the later date in the northern part; I call upon every citizen to observe the day by encouraging the planting of trees and shrubbery and advancing the cause of reforestation; I likewise urge every school to observe the day by appropriate exercises, such as the dedication of trees, conducting meetings and discussions, and promoting other projects that will assure for Pennsylvania and the Nation an adequate and abundant natural wealth and beauty for all time.

By the Governor: ARTHUR H. JAMES.

S. M. R. O'HARA,

Secretary of the Commonwealth.

APPENDIX C

QUOTATIONS FROM PROMINENT CONSERVATIONISTS

THEODORE ROOSEVELT, in address at dedication of the Department of the Interior Building:

"We are now devoting our energies to the conservation of our God-given wealth. Employing every agency of the Government at hand to protect our birthright, we have in the past several years made advances far beyond the hopes of earlier-day conservationists. But the battle goes on, and, as in the case of other battles, it is a battle against the law of opposition. That battle must be carried forward with renewed vigor if future generations are to receive the full benefits that are their due."

HAROLD L. ICKES, Secretary of the Interior, in address before Education Conservation Society, February 17, 1934:

"It ought not to be necessary to argue that our children in the schools should be taught the importance from a practical point of view of making a wise but nevertheless selective use of the bounties of nature. It ought also to be taken for granted that their education would not be complete if they did not learn from those competent to teach, the spiritual qualities that abide in mountain, stream, and plain. I am sure that many will agree with me that those schools which fail to furnish the instruction and the inspiration that comes from an intelligent consideration of the subject of conservation, are in reality as backward as the log schools of our great grandfathers, however advanced they may think they are."

HARRY G. VAVRA, National President, Educational Conservation Society, in radio address on Public Service Education, April 1, 1935:

"Fundamentally, the basis of national prosperity and the happiness of present and future generations are dependent upon the conservation of the nation's natural resources. Ultimately, we obtain our food and clothing from the soil. Our forests not only conserve the soil, but help to prevent floods and severe droughts. They provide us with various products and homes for wild life. They have recreational and æsthetic values. Our waters are valuable for meeting domestic and community needs, for supplying power and irrigating arid lands, for providing homes for fish life and feeding places for waterfowl, for providing recreational and æsthetic opportunities, and for promoting navigation. Our subsoil resources, such as minerals, coal, peat, limestone, potash, saline deposits, chemical waters, oil and gas, serve a variety of industrial and commercial purposes. They are a necessity to civilization. Our wild life resources have great æsthetic and recreational as well as economic values. The beauty and health-giving influences of unspoiled nature are of serious concern to the public."

APPENDIX D

BIOGRAPHIES OF PROMINENT CONSERVATIONISTS

JOHN JAMES AUDUBON

John James Audubon, son of a French naval officer, contributed so much to ornithology that his writings of a century ago are still considered standard text books. The Audubon Societies are named in his honor.

Audubon's early life is somewhat obscure. Born at Les Caves, Santo Domingo, on April 26, 1785, he went to Nantes, France, where he studied drawing. As a child, he began to paint birds and animals. For a year after he came to the United States Audubon studied birds along the Perkiomen Creek near Philadelphia. This year of work became the basis for his famous collection of bird paintings, still considered one of the finest ornithologies of the world.

After his marriage to Lucy Bakewell in 1808, he moved to Kentucky. Later the family moved to Louisiana, but wherever he happened to be, Audubon painted and studied bird life. In 1826 his great work, "The Birds of America," was elaborated into the "Great Series" of 435 plates.

From 1827 to 1838 Audubon pubished a series of 1,065 colored figures of American birds which is still one of the most attractive and beautiful ornithologies of the world. In 1839 five volumes were issued under the title: *Ornithological Biography.* Many editions and reprints were issued later, of which the most important was the Octavo Edition of 1844.

In 1842, after twelve years spent in explorations, he bought a home on the Hudson River at a place north of New York City, now known as Audubon Park.

Audubon died in New York on January 27, 1851. He was buried in Trinity Cemetery, New York, close to his home woods.

JOHN BARTRAM

"The father of American botany" was born near the village of Darby in Delaware County on March 23, 1699, and died September 22, 1777. Bartram was America's earliest native botanist. At Kingsessing he established the first botanical garden on this continent. Linnæus termed him "the greatest natural botanist in the world."

Bartram purchased the ground for his garden along the Schuylkill River, about three miles from Philadelphia. The plot had good top soil, and here Bartram developed the first botanical garden in America for the cultivation of the various vegetables native to this country.

For many years he carried on an extensive correspondence with eminent European naturalists, to whom he sent large plant collections in exchange for books. At his home near Philadelphia he received as his guests many visitors attracted by his reputation for learning and hospitality.

About the year 1730 Bartram, who from his youth had been passionately fond of natural history and especially of botany, began to make collections of American plants and seeds. He probably discovered more new plants than any of his contemporaries.

Bartram was a man of modest and gentle manners, frank, cheerful, and a lover of justice. He wrote a small but interesting book entitled *Observations on the Inhabitants, Soil, Divers Productions* in 1751. He also contributed papers to the Transactions of the Philosophical Society.

DANIEL CARTER BEARD

Daniel Carter Beard, though by this name his many friends would hardly recognize Dan Beard, American author, illustrator, and great outdoor enthusiast, was born in Cincinnati, Ohio, June 21, 1850. He took an academic degree at Worralls' Academy, Covington, Kentucky, and later studied four years at the Art Students League in New York.

Dan Beard originated and instructed a pioneer class in illustration and was teacher in animal drawing in the Women's School of Applied Designs from 1893 to 1900. This is said to be the first organized class in animal drawing in the world. His illustrations have appeared in many standard magazines and books, notably Mark Twain's "Connecticut Yankee at King Arthur's Court."

He originated the first Boy Scout Society in 1908, upon which English organizations were modeled. He was chosen National Commissioner, National Scout Commander, and honorary vice-president of the Boy Scouts of America. He received the Golden Eagle badge, the only one ever given; the Roosevelt gold medal for distinguished service (one of three awarded), and the United States Medal for Conservation.

A great nature enthusiast, he has written many books on conservation and outdoor life. Much of his Boy Scout work in camping and woodcraft is directed toward the protection of forests and animals.

Among his works are *Boys Handy Book,* 1882; *Outdoor Handy Book,* 1900; *Field and Forest Hand Book,* 1906; *Dan Beard's Animal Book,* 1907; *Camp Lore,* and *Woodcraft and Wisdom of the Woods,* 1927. He was editor of "Recreation," 1905-1907; associate editor of "Boys' Life," and chief of a school of woodcraft operated under the name of "Dan Beard's Outdoor School." His studio is at Flushing, Long Island, New York.

LUTHER BURBANK

Born March 7, 1847, the youngest of a family of thirteen children, Burbank became world famous for his plant orginations. His father, Samuel Walton Burbank, was a farmer and a manufacturer of brick and pottery. Luther Burbank attended grammar school in Lancaster, Worcester County, Massachusetts, and later spent four years at Lancaster Academy.

When Burbank was twenty-one his father died, and Luther immediately began to experiment with varieties of vegetables which could be brought to the market ahead of the regular season and thereby command better prices. Burbank made a modest success of this commercial venture, and by crossbreeding he produced his now famous "Burbank potato." This potato became a sensation and Burbank had many offers to sell it. In 1875 Burbank sold his seventeen acres of land, together with his Burbank potato. Burbank had long realized that Massachusetts climate was too severe for experimental work, and the sale of his potato provided him with sufficient capital to move to Santa Rosa, California. Under the terms of the sale of his potato, Burbank was permitted to retain only ten potatoes for further experimentation. With these he produced many other varieties.

In California Burbank had a nursery garden and a greenhouse where he carried on his creative work for fifty years. In the greenhouse he raised thousands of plants and conducted many experiments, but he found his greatest success in the fields outside. His most intensive work was done with plums, berries, and lilies. He imported seedlings from Japan and in his experimental gardens he had scores of plum trees bearing as many as 600 varieties of plums on a single tree. As a result of his plum tree experiments he introduced many new varieties of plums, quinces, apples, peaches, nectarines, and almonds.

Second in importance probably was his work with berries in which he once again produced new varieties of blackberries, dewberries, and raspberries.

By crossbreeding fifty varieties of lilies he produced many new strains. By multiple crossings of the common American field daisy with European species he produced the giant Shasta daisy.

Burbank's entire life was his work. His findings could have made him tremendously wealthy, yet he made only enough money to live comfortably. At his own request he was buried beneath the cedar he planted near his cottage in California. After his death on April 11, 1926, his experiments were continued under the guidance of his widow.

JOSEPH S. ILLICK

Joseph S. Illick, the forester, was born in Easton, Pa., on September 16, 1884. He graduated from Lafayette College in 1907, engaged in special study at the University of Munich in 1910-11, and studied forestry at the Biltmore Forest School in 1911-1913.

In 1907 Illick was appointed instructor at the Pennsylvania State Forest School, in 1911 he became professor of forestry, and in 1918 was appointed acting director of the school.

He was appointed chief of silviculture and research in the Pennsylvania State Department of Forestry in 1919 and continued in that office until 1927 when he was made State Forester, a position he occupied until 1931.

Illick was appointed as the head of the Department of Forest Management of the New York State College of Forestry in 1931. He is a Fellow of the American Academy for the Advancement of Science and a member of the American Forestry Association, and the Society of American Foresters.

Illick is the author of *Tree Habits—How to Know the Hardwoods* (1924); *Pennsylvania Trees* (1925); *Outline of General Forestry* (1935); *In Penn's Woods* (1925).

JULIUS STERLING MORTON

Julius Sterling Morton was a political leader, pioneer newspaperman, and ardent nature lover. He was born on April 22, 1832, at Adams, New York, and died in Nebraska on April 27, 1902.

When he was two years old his parents moved to Michigan, and at the age of eighteen, Morton entered the Methodist Episcopal Academy at Albion from which institution he was graduated in 1854.

In the following year he went to Nebraska, going first to Bellevue and later to Nebraska City where he founded and edited the first newspaper in the Territory. When only twenty-four years old Morton was elected to the Territorial Legislature, and in 1858 he was appointed by President James Buchanan as Secretary of the Territory. Upon the resignation of Governor Richardson he was made acting

Governor and the local representative of the administration in the bitter struggle then being carried on over slavery.

In 1866, Morton was the Democratic Party candidate for Governor and after being defeated did not actively participate in politics as a candidate until 1881 when he was again defeated for the Governorship.

President Grover Cleveland appointed Morton Secretary of Agriculture in 1893. He remained in office until 1897, filling the post efficiently. In 1901 he was appointed by President McKinley as one of the U. S. Commissioners for the Louisiana Purchase Exposition.

Morton was a student of forestry and an active proponent of conservation and extension of forest resources. Upon his suggestion the Nebraska Legislature in 1874 appointed a day for tree planting throughout the State. This custom earned Nebraska the title of the Tree Planters' State and resulted in the eventful establishment of Arbor Day throughout the United States and Canada. He was president of a number of agricultural societies and an active member of several horticultural societies. His only book was an illustrated *History of Nebraska,* published in 1905.

JOHN MUIR

John Muir, the American naturalist, was born in Dunbar, Scotland, on February 5, 1838. His father moved to a farm in Wisconsin when John was eleven years of age. Life on the frontier is told by Muir in *The Story of My Boyhood and Youth.*

As a youth, Muir found time to study nature and to educate himself by reading with discrimination in books that were mostly borrowed. He would often arise as early as one in the morning to read and study.

Young Muir invented, among other things, a wooden clock that told the time of day, the day of the week, and the month of the year, and automatic feeder for horses; and a combined thermometer, hygrometer, barometer, and pyrometer.

A neighbor prevailed upon the young inventor to exhibit his handiwork at a fair in Madison. He left home for the first time when twenty-one years of age and took a train from the railroad station, which; though only nine miles from home, he had never seen before. His reception at the fair was a heartening one and his display attracted much attention. It was upon the advice of an acquaintance made at the fair that Muir sought entrance to the University of Wisconsin and was accepted. He did not take a regular course but picked out in his four years at the University what he thought would be most useful to him, namely chemistry, mathematics and physics, a little Greek and Latin, botany, and geology. Later, he said of his education, "Anyhow I wandered away on a glorious botanical and geological excursion, which has lasted nearly fifty years and is not completed, always happy and free, poor and rich, without thought of diploma or of making a name, urged on and on through endless, inspiring Godful beauty."

An accident after he left college made him fear his eyes were "closed forever to all of God's beauty" and prompted him to tramp around the Great Lakes and later to undertake his first long tramping trip to Florida and Cuba of which he wrote in *A Thousand Mile Walk to the Gulf.*

Muir next went to California, arriving there in 1868. After a visit to the Yosemite Valley, "on the grand side of the mountains," he made it his central camp for ten years while studying the forests and glaciers of the Sierra Nevada.

His first trip to Alaska was in 1878 when he explored the great river of ice which enters Glacier Bay and was named Muir Glacier for its discoverer. He made two other expeditions into Alaska and the Arctic region.

John Muir was a pioneer conservationist, preceding the conservation movement by many years in his advocacy of the preservation of the forests and the establishment of national parks. It was partly through his influence and efforts that the United States Government has carried on the great work of creating National Parks. Both the Sequoia and Yosemite were created largely due to his efforts.

He traveled extensively throughout Europe and in 1903-04 made a trip around the world.

Yale and the Universities of Wisconsin and California gave him honorary degrees. He was a member of the American Academy of Arts and Letters.

His writing besides hundreds of newspaper and magazine articles include: *The Mountains of California* (1894); *Our National Parks* (1909); *My First Summer in the Sierra* (1911); and *The Yosemite* (1912). After his death there appeared *Letters to a Friend* and his unpublished prose and letters, which contained an almost complete work on Alaska.

GIFFORD PINCHOT

The name Pinchot is almost synonomous with forestry—especially, forestry conservation—for even while a student at Yale he had the reputation of being "mad about trees." His definitions of conservation are: the greatest good to the greatest number; and, the application of common sense to common problems for the common good.

Gifford Pinchot was born on August 11, 1865, at Simsbury, Conn. After graduating from Yale University in 1889, he studied forestry in England, France, Germany, and Switzerland. Upon his return in 1892 he began the first systematic forestry work ever undertaken in the United States on an estate in North Carolina. This endeavor attracted so much attention that the following year he established himself in New York City as a consulting forester.

From 1897 to 1910 he served the United States Government as an agent in the Department of the Interior, Chief of Forestry, and head of the Bureau of Forestry—a branch of the service which was transferred to the Department of Agriculture in 1905. During this period he also served on commissions concerned with public lands, government scientific work, administrative efficiency, inland waterways, and country life.

President Theodore Roosevelt attributed his own interest in conservation to Mr. Pinchot's influence. Upon the suggestion of Mr. Pinchot the President called a "Conference of Governors" to the White House in May 1908, which was attended by governors of thirty-four states, and by others associated with the conservation movement.

The conference resulted in the establishment of conservation commissions in many states; and in the creation of the National Conservation Commission. This commission consisted of forty-nine members, divided into four sections, which reported respectively in minerals, waters, forests and soils. The reports of their investigations, published in 1909, gave the United States the first inventory of natural resources possessed by any nation, for the report contains a statement as to the country's natural wealth, the amounts already used and the probable duration of their future life.

Under Pinchot the United States Forest Service developed in ten years from a minor division in the Department of Agriculture to an organization administering nearly 200,000,000 acres of forest land. To his influence can be credited a comprehensive policy of conservation of timber resources. During Mr. Pinchot's tenure of office 234,000,000 acres of government domain including timber, coal, phosphate lands, and valuable water power sites were withdrawn from the possibility of private ownership. It was he that first suggested the building of a railroad from the coast to the coal fields in Alaska which the government undertook and completed in 1916.

He is one of the founders of the Pinchot School of Forestry at Yale University. In 1920-1923 he served as Pennsylvania's Commissioner of Forestry, and later was elected to the governorship under the affectionate nickname, "The Tall Forester."

His writings include: *The White Pine* (1896) ; *A Study of Forest Fires and Wood Production in Southern New Jersey* (1897) ; *The Timber Trees and Forests of North Carolina* (1897) ; *The Adirondack Spruce* (1898) ; *Primer of Forestry* (1899) ; and *The Fight for Conservation* (1909).

MAJOR JOHN WESLEY POWELL

John Wesley Powell was born in Mount Morris, New York on March 24, 1835. His childhood was spent in Ohio, Wisconsin, and Illinois. Powell achieved fame and distinction as a soldier, geologist, explorer, and anthropologist. He studied in the preparatory departments of Wesleyan College at Wheaton, Ill., and Illinois College. He continued his education at Oberlin College, where he discovered his bent toward natural science.

He enlisted as a private at the outbreak of the Civil War and saw active service. During the battle of Shiloh he lost his right arm. He was promoted to the rank of major and subsequently was offered a commission as colonel, which he refused. At the conclusion of the war he accepted an appointment as professor of geology and curator of the museum at Illinois Wesleyan University. In 1867 he accepted the chair of geology at Illinois Normal University.

The following summer he visited the Rocky Mountains for exploration and research. In 1869, he led an exploration party into the Grand Canyon of the Colorado, a feat which brought him prominence in the scientific world. In the same year he induced Congress to establish a geological and topographic survey of the Colorado River and its tributaries, an undertaking which required ten years to complete.

By 1874 there were four Colorado surveys underway, all acting independently and in competition with each other. Powell proposed a more integrated system, and in 1879, Congress established the United States Geological and Geographic Survey. Powell was appointed director of the Survey in 1881 and served until 1894 when he resigned to assume the directorship of the Bureau of Ethnology. He made extensive studies of the American Indians for the Smithsonian Institution, the reports of which were published in 1876 as contributions to North American ethnology. He served as director of the Bureau of Ethnology until his death in Haven, Maine, September 23, 1902.

Among his writings were: *Explorations of the Colorado River* (1875) ; *Report on the Uinta Mountains* (1876) ; and *Truth and Error* (1899).

THEODORE ROOSEVELT

Theodore Roosevelt was born in New York City on October 27, 1858. Despite serious handicaps of asthma and near-sightedness that interrupted his schooling, he attained good health through gymnastic exercises and outdoor sports.

Roosevelt entered Harvard in 1876, where he specialized in natural history. After his graduation he studied law at Columbia University.

Theodore Roosevelt served as a member of the New York State Legislature; member of the Civil Service Commission under President Harrison; President of New York City Police Commission; Assistant Secretary of the Navy; Colonel of United States Volunteer Cavalry, "The Rough Riders;" Governor of New York; Vice-President and President of the United States.

His interest and activity in conservation and like movements covered a wide field. In 1907 he called public attention to the waste of natural resources and warned of the danger of natural resources getting into the hands of private interests to be used against the public welfare. He considered that, "the conservation of our natural resources and their proper use constitute the fundamental problem which underlies almost every other problem of our national life." He had already signed the Reclamation Act, providing for the reclamation and irrigation of the arid lands of the West.

In 1908 President Roosevelt called a "Congress of Governors" to meet in the White House. This conference laid the basis for the appointment by the President of the National Conservation Committee the same year. The report of this committee published in 1909 furnished the United States Government with the first inventory for any country in the world of lands, minerals, forests, and waters.

President Roosevelt was authorized by the National Conservation Committee to invite Canada and Mexico to join with the United States in a movement for the conservation of the resources of the entire continent. In February 1909 the North American Conservation Conference was held, one of its recommendations being that the conservation movement be made world-wide.

Early in 1907, President Roosevelt appointed the Inland Waterways Commission to investigate and recommend a full and comprehensive plan for the development and use of the water resources of the country. In 1909 when steps were taken to prevent the great industrialists from obtaining control of valuable natural resources in Alaska, President Roosevelt, in line with his earlier policy, led in the support of a plan for government ownership with leases to corporations.

After the election in 1908, Roosevelt went to Africa to secure zoological specimens for the Smithsonian Institution. His book, *African Trails,* contains the record of a year (1909-10) in the jungles.

Theodore Roosevelt's writings include: *Life Histories of African Game Animals* (1914); *Through the Brazilian Wilderness* (1914); *Hunting the Grizzily* (1905); *The Wilderness Hunter* (1893), and *The Winning of the West* (four volumes, 1889-1896).

JOSEPH TRIMBLE ROTHROCK

The American botanist Joseph Trimble Rothrock was born in McVeytown, Pa., April 9, 1839. He died on June 21, 1922.

Rothrock was graduated from Harvard in 1864 and after service on the Wheeler Geographical Survey he completed a course in medicine at the University of Pennsylvania. He served as professor of botany at the University from

1877 to 1893. For a period during the Civil War he was captain of Pennsylvania cavalry.

Gifford Pinchot, as Governor of Pennsylvania at the unveiling of a monument to the memory of Dr. Rothrock at McVeytown on November 1, 1924, said that Dr. Rothrock established the first outdoor boys' club in Pennsylvania and, possibly, in America.

As a physician, he established the first State tuberculosis sanatorium in Pennsylvania at Mont Alto in 1903, and served as its superintendent from 1905 to 1908.

As an educator, he planned and established the first school in America for the professional training of State Forestry officials, and took charge of it when the occasion demanded.

Dr. Rothrock established the Department of Forestry of Pennsylvania and served as Commissioner of Forestry from 1893 to 1905. He gave Pennsylvania the first organization in forest protection of any of the states. Dr. Rothrock was tireless in his devotion to the task of conserving the forest resources and lived to see the world wide adoption of his forest conservation and protected policies.

His writings include: *Flora of Alaska* (1867); *Botany of the Wheeler Exposition* (1878); *Vacation Cruisings* (1884); and *Pennsylvania Forest Reports* (1895-1897).

ERNEST THOMPSON SETON

Ernest Thompson Seton was born in England on August 14, 1860, but moved to Canada in early boyhood. Seton was educated at Toronto Collegiate University, and, for a brief time, attended the Royal Academy in London.

After his return to Canada he spent three years in zoological study on the Assinboin River in Manitoba. In 1891 he was made government naturalist of the province.

At different periods from 1890 to 1896, Seton studied under Mosler, Ferrier, Bougereau, and Gerome in Paris. Several drawings of his were exhibited at the Paris Salon. He made more than 1,000 drawings of animals and birds to illustrate the Century dictionary.

He became widely known because of the cleverness of his stories about animals. His method of attributing unnatural, mental and moral characteristics to his storied animal figures was criticized sharply by the veteran naturalist John Burroughs, and by experienced woodsmen.

Believing that training in outdoor life would improve the chances for boys to become good citizens, he organized the Woodcraft Indians and by 1901 had several groups of boys organized. The movement was introduced into England under the influence of General Baden Powell and became known as the Boy Scouts. In 1910 the Woodcraft Indians led by Seton, merged with Beard's Sons of Daniel Boone and became known as the Boy Scouts of America. Seton served as Chief Scout of this organization until 1915, when, because of disaffection, he resigned. Thereupon he turned his attention to the Woodcraft League.

His real name is Ernest Seton Thompson—the Thompson Seton being used for literary purposes. His best known writings, largely illustrated by himself, include: *Wild Animals I Have Known* (1898); *The Trail of the Sandhill Stag* (1899); *Tabo, Rag, and Vixen* (1899); *The Biography of A Grizzily* (1900); *Lives of the Hunted* (1900); *Two Little Savages* (1903); *Monarch, the Big Bear of Talloe* (1904); *Animal Heroes* (1905); *Woodmyth and Fable* (1905); *Life Histories of North American Animals* (Two Volumes, 1909); *The Biography of A Silver Fox* (1909); *The Boy Scouts of America; A Handibook* (1910); *The Arctic Prairies* (1911); *Woodcraft and Indian Lore* (1912); *Wild Animals at Home* (1913); *Manual of the Woodcraft Indians* (1915).

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